



# DEFENDER 90.110 · 130



DEFENDER  
LT77S GEARBOX

WORKSHOP MANUAL SUPPLEMENT

Publication Number SLR 621 EN WS 2

Published by the  
Technical Publications Department of



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Land Rover  
Lode Lane  
Solihull  
West Midlands, B92 8NW  
England



# 37 \_MANUAL GEARBOX

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## 37 - MANUAL GEARBOX

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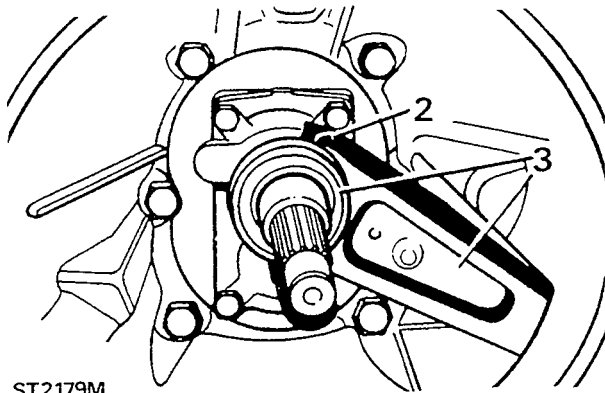
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**DISMANTLE**

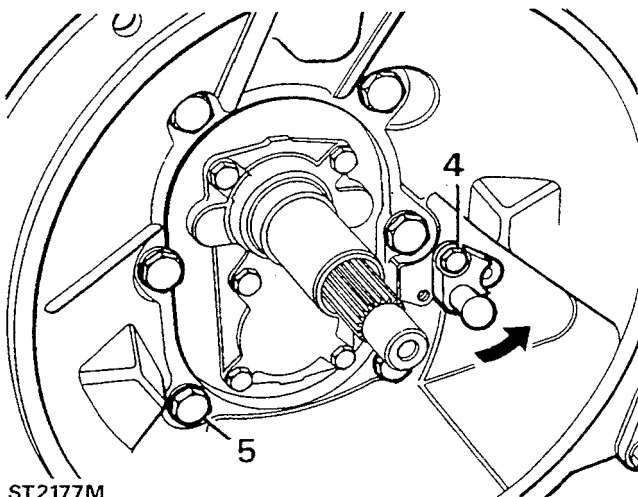
**Bell housing - four cylinder engine**

1. Remove transfer box, drain oil and clean exterior.
2. If fitted, clutch release bearing clip.
3. Remove clutch release assembly.



ST2179M

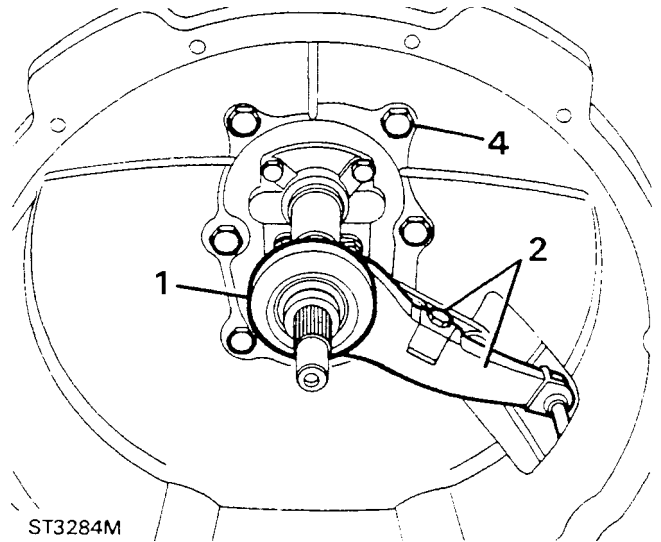
4. Remove one pivot post bolt, slacken the other and move post aside.
5. Remove six bolts and withdraw bell housing.



ST2177M

**Bell housing - V8 engine**

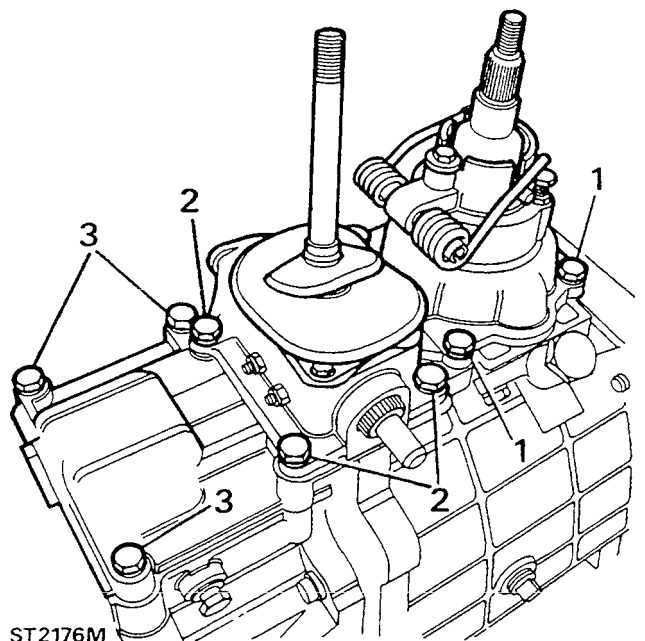
1. Remove clutch release bearing.
2. Remove screw and spring clip and remove release lever.
3. Remove "C" clip from pivot post.
4. Remove six bolts and bell housing.



ST3284M

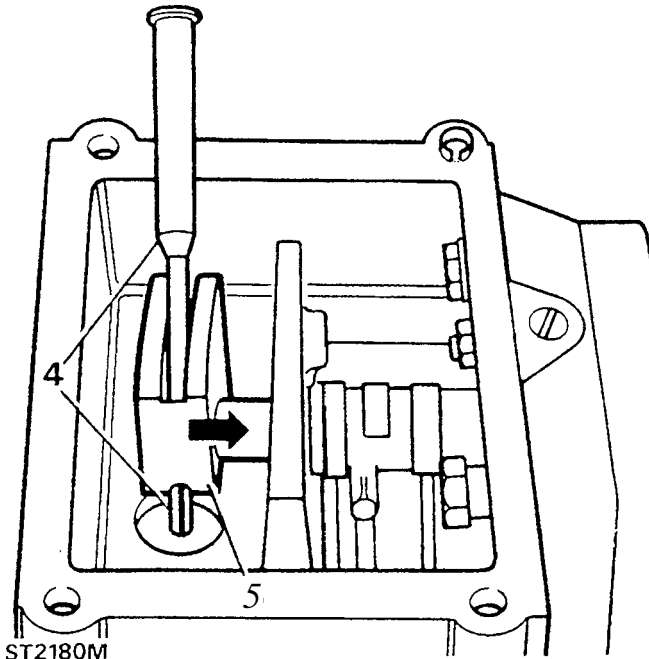
**GEAR SELECTOR HOUSING**

1. Remove four bolts and remove main gearbox selector housing.
2. Remove transfer box housing.
3. Remove remaining bolts and remove remote housing.

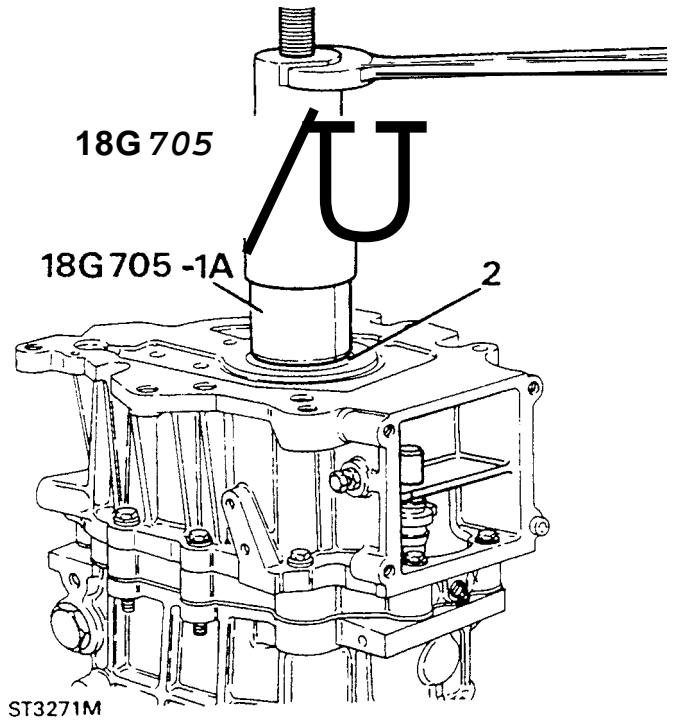


ST2176M

4. Drive out quadrant roll pin.
5. Move selector shaft forward to remove quadrant.

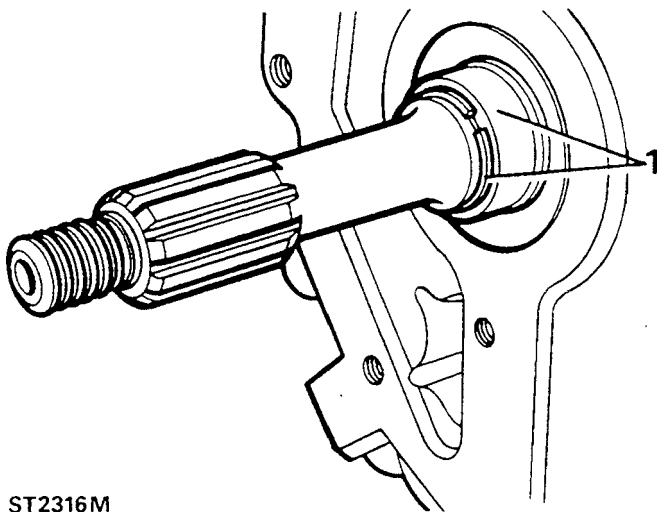


2. Using service tool 18G 705 and 18G 705-1A withdraw the oil seal collar.

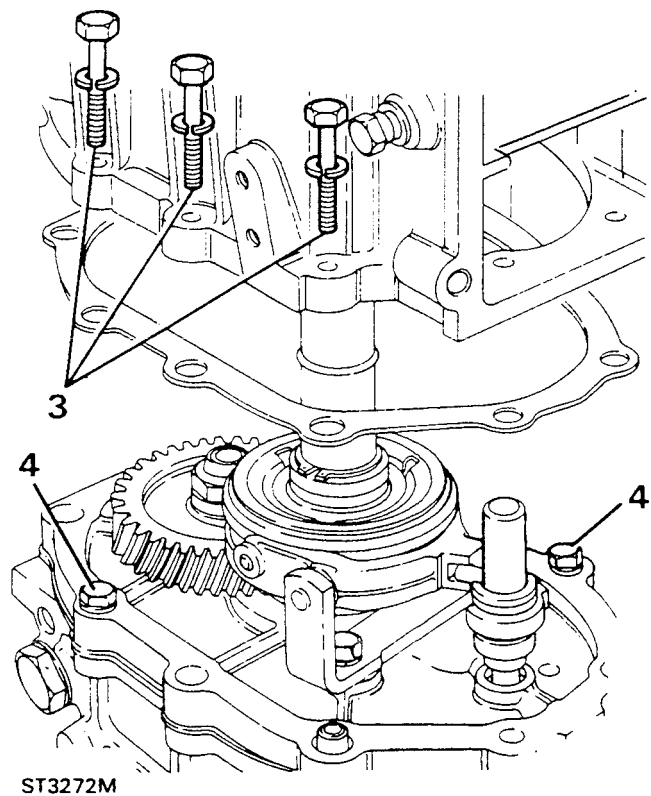


**EXTENSION HOUSING**

1. Remove snap ring retaining oil seal collar.



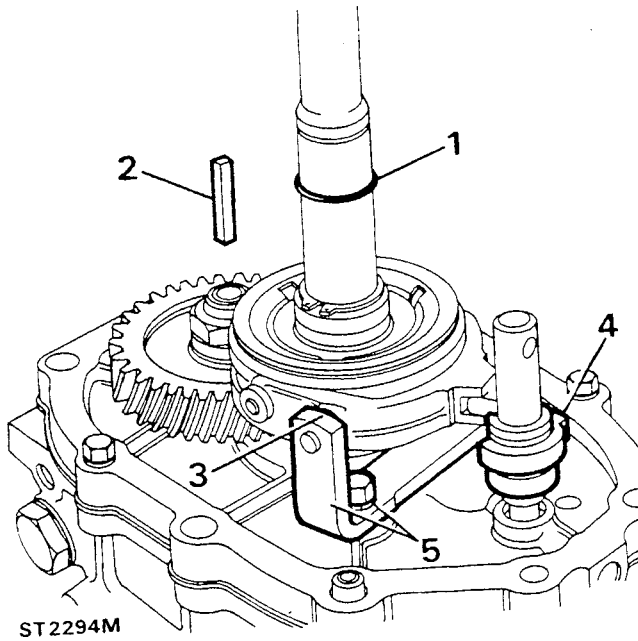
3. Remove the fifth gear extension housing.
4. Secure the centre plate to the gearcase with two 8 x 35mm bolts.



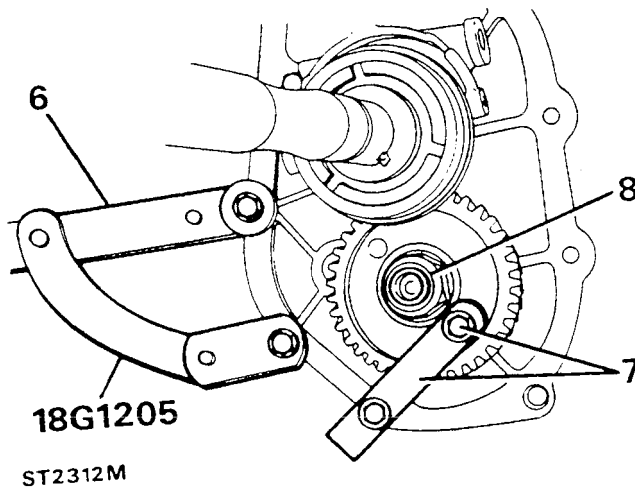


**MAINSHAFT AND LAYSHAFT FIFTH GEARS**

1. Remove mainshaft "O" ring.
2. Remove oil pump drive shaft.
3. Remove "E" clips from selector fork.
4. Remove fifth gear selector spool.
5. Remove selector fork bracket.



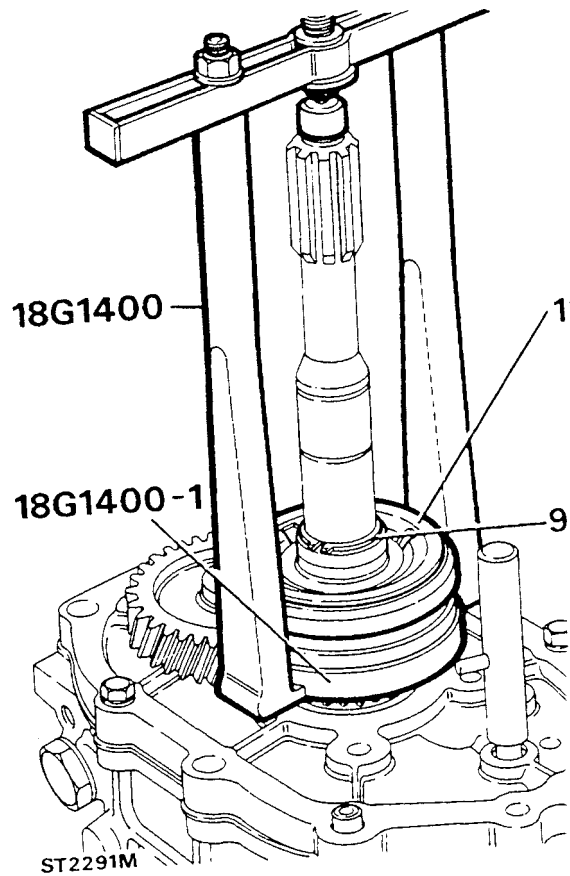
6. Locate flange holder tool 18G 1205.
7. Fit manufactured tool "A" and spacer to restrain layshaft fifth gear.
8. De-stake and remove fifth gear nut.



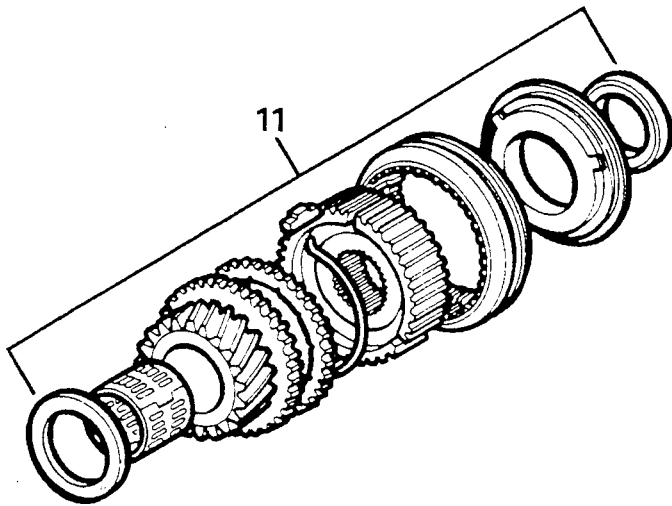
9. Remove circlip retaining mainshaft fifth gear synchromesh.
10. Fit special tool 18G 1400-1 and 18G 1400 as illustrated.



**CAUTION:** ensure the puller feet locate the two cut-outs in 18G 1400-1 and between the pins.

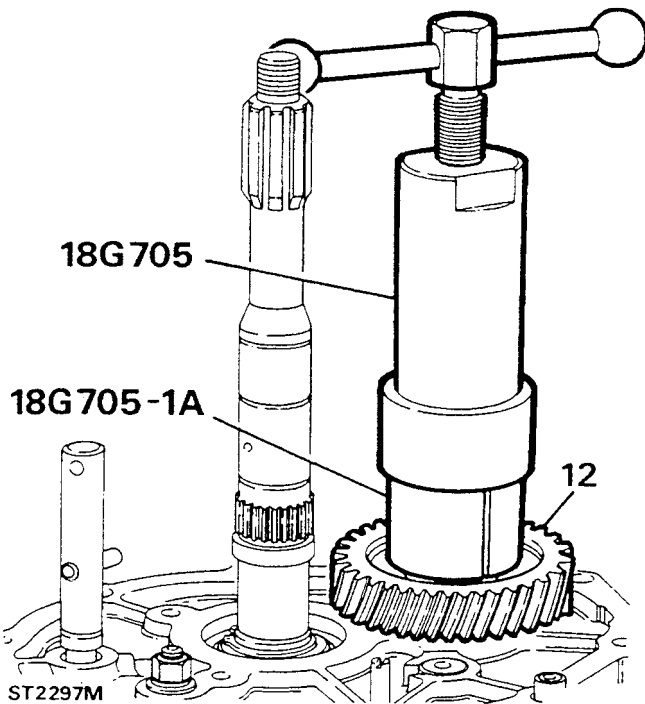


11. Remove fifth gear synchronesh.

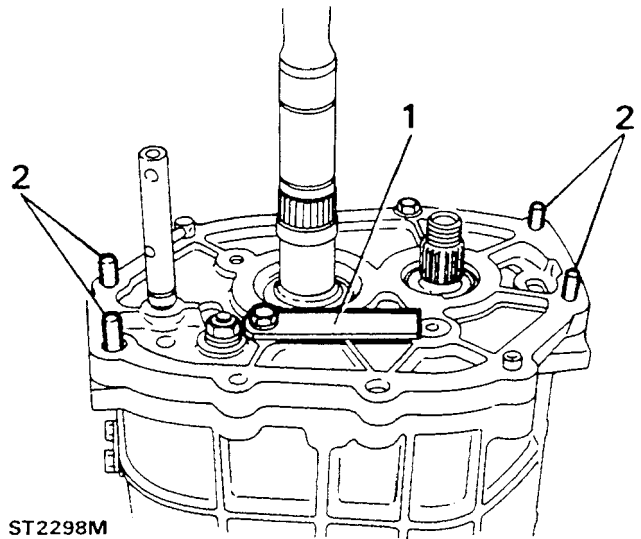


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12. Remove layshaft fifth gear using special tools 18G 705 and 18G 705-1A.



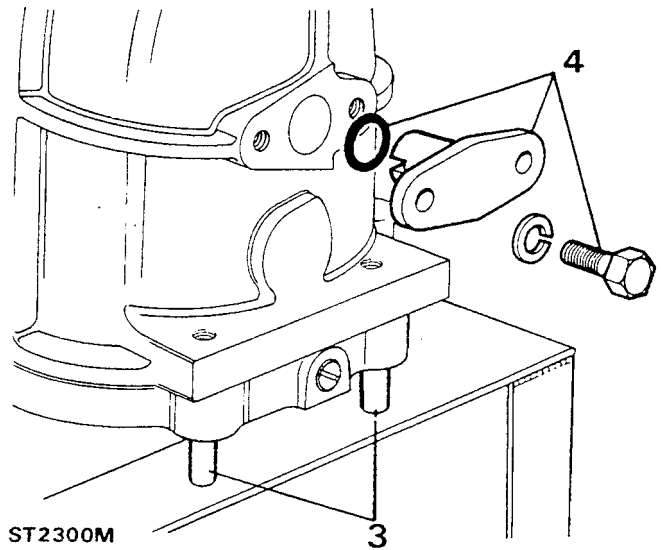
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ST2298M

3. Invert gear case and locate studs in workstand holes.

4. Remove selector shaft spool retainer.



ST2300M

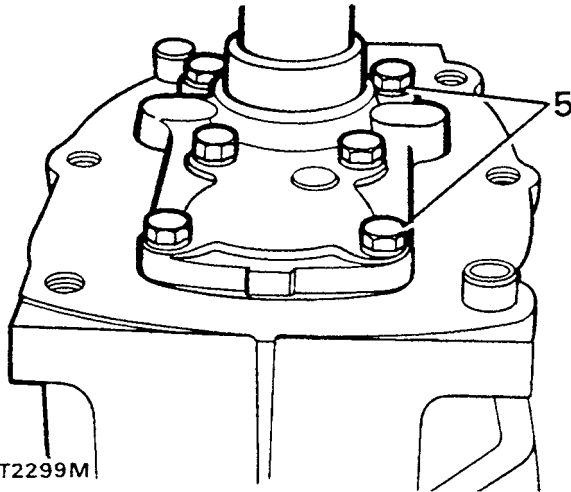
**Main gear case.**

1. Secure reverse shaft retainer, manufactured tool "A", to centre plate.
2. Fit studs, manufactured tool "B" to gear case.



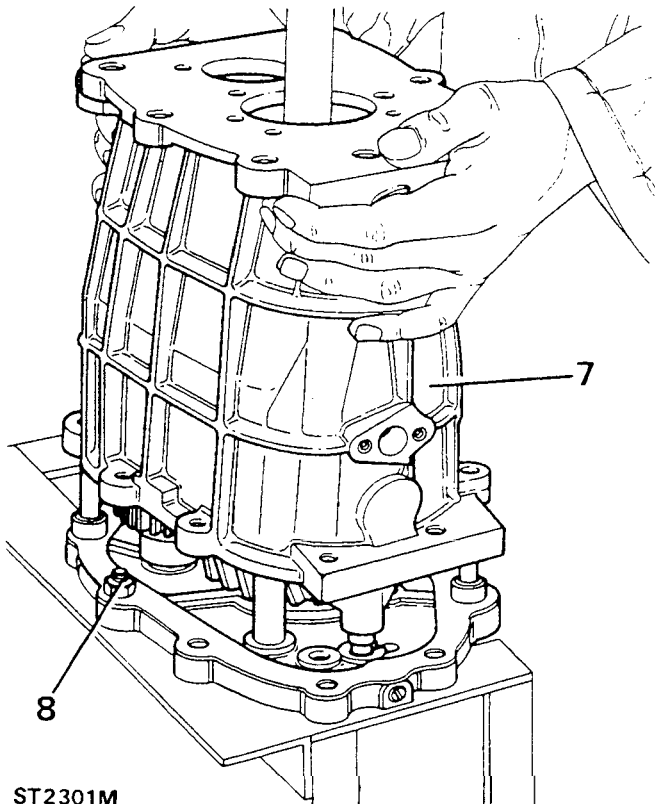


5. Remove front cover and gasket.
6. Retrieve selective washers.



ST2299M

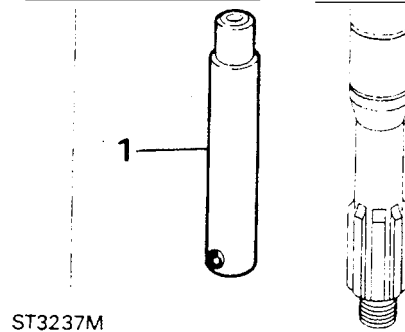
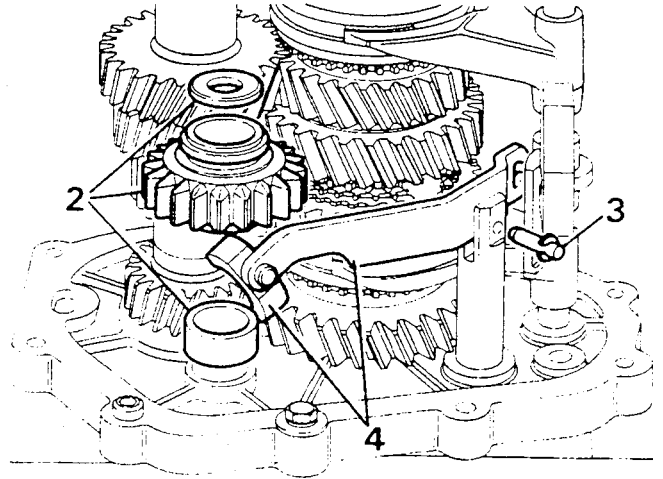
7. Remove bolts and lift-off gear case.
8. Secure centre plate with nut and bolt.



ST2301M

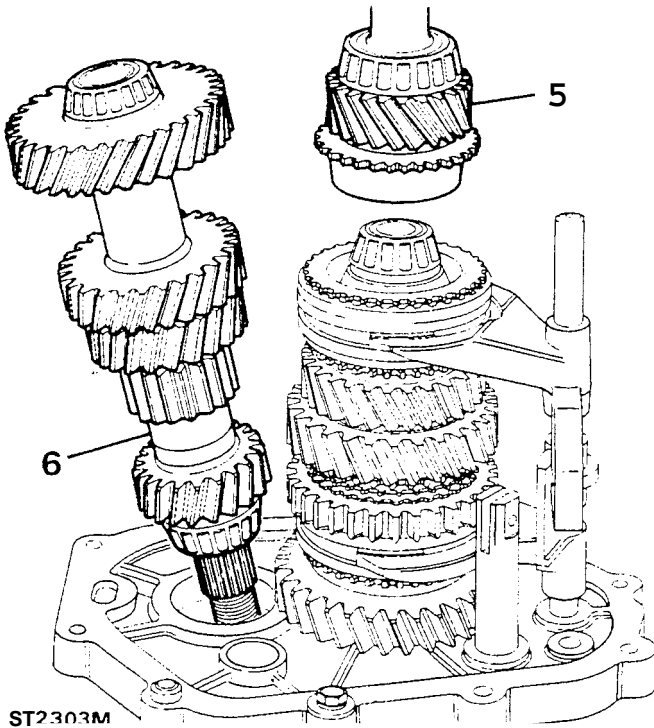
**REVERSE SHAFT, LAYSHAFT AND MAINSHAFT**

1. Remove retainer (tool "A") and reverse shaft.
2. Remove thrust washer, reverse gear and spacer.
3. Remove reverse lever pin with "E" clip attached.
4. Remove lever and slipper pad.

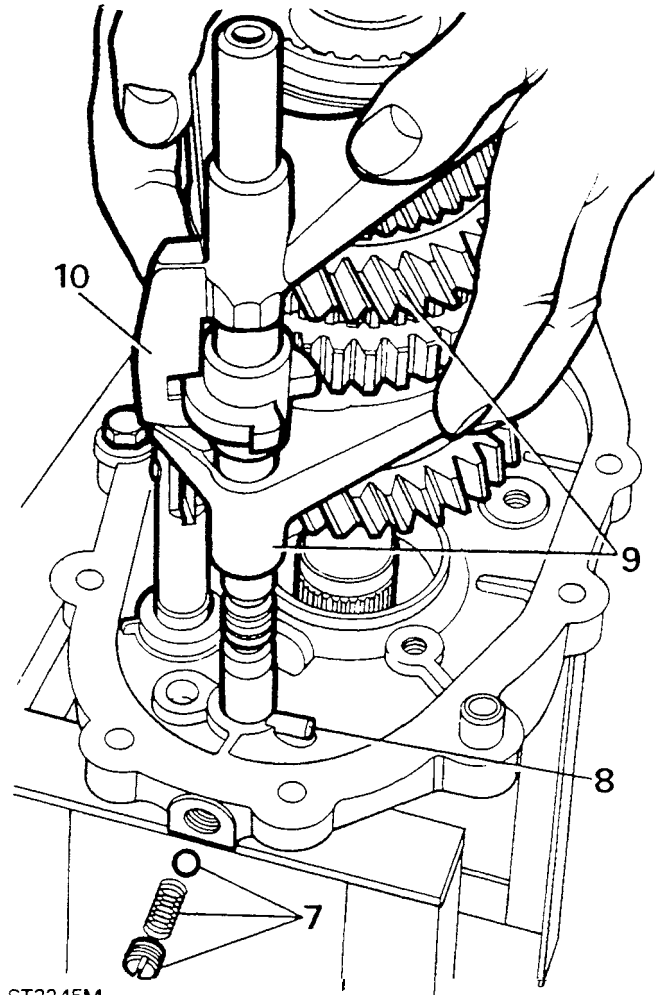


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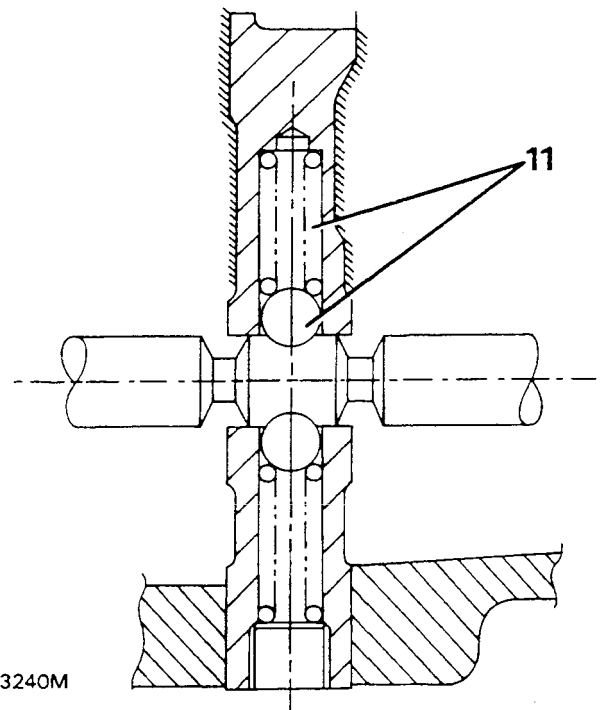
- 5. Remove input shaft and fourth gear baulk ring.
- 6. Remove layshaft by tilting, as illustrated and lifting mainshaft.



- 7. Unscrew plug and remove spring and outboard detent ball.
- 8. Align fifth gear selector pin with centre plate slot.
- 9. Remove mainshaft, gears, selectors and forks.
- 10. Remove selector fork assembly from gears.

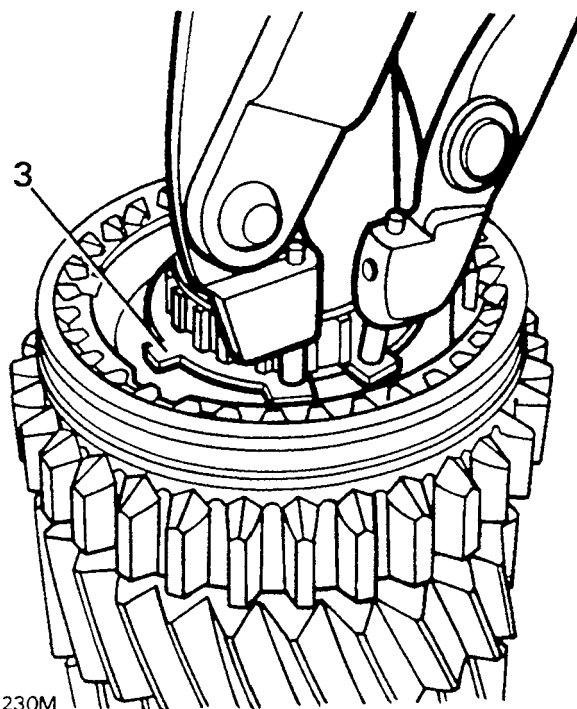
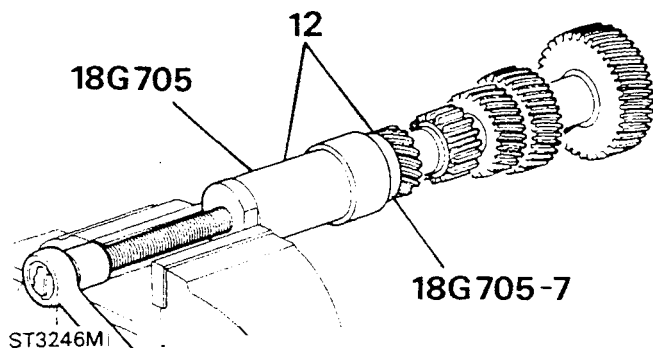


- 11. Collect inboard detent ball and spring from centre plate.





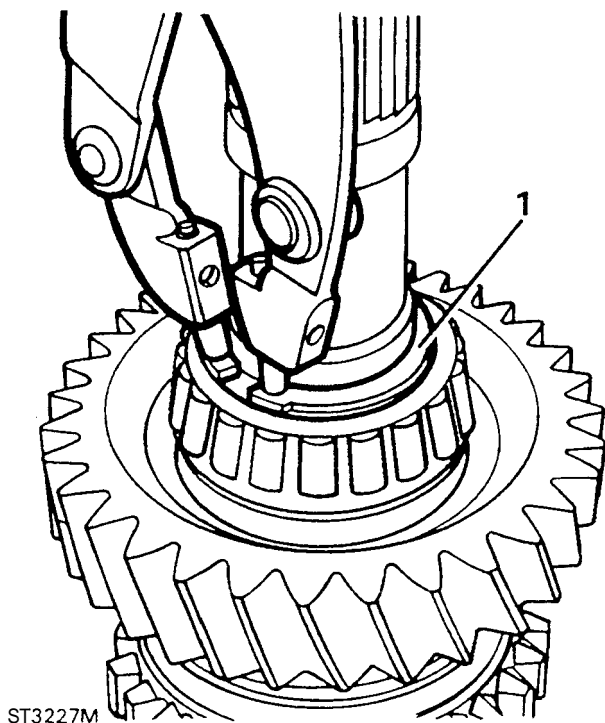
- Using extractor tool 18G 705 and collets 18G 705-7, withdraw layshaft bearings.



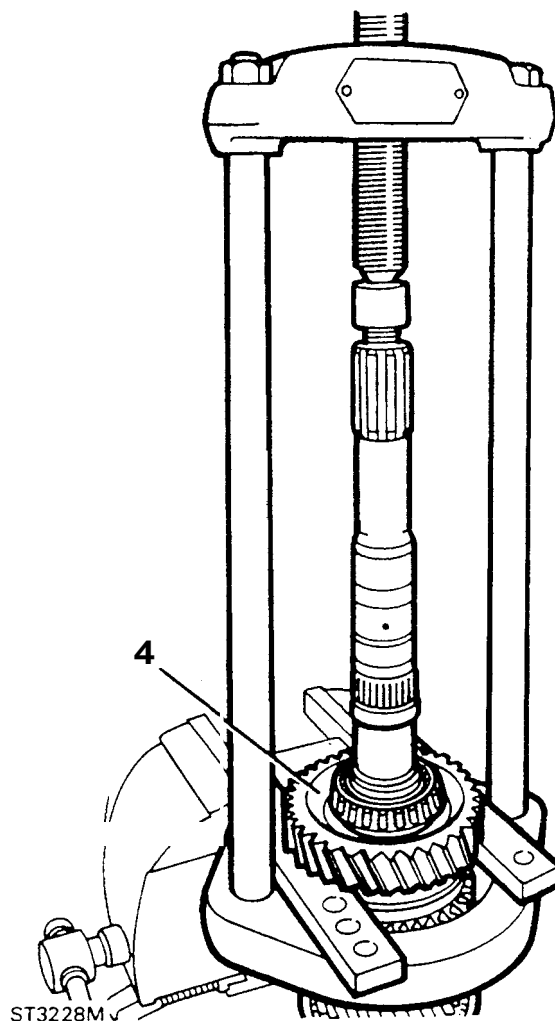
**DISMANTLE MAINSHAFT**

- Remove circlip retaining first gear assembly.

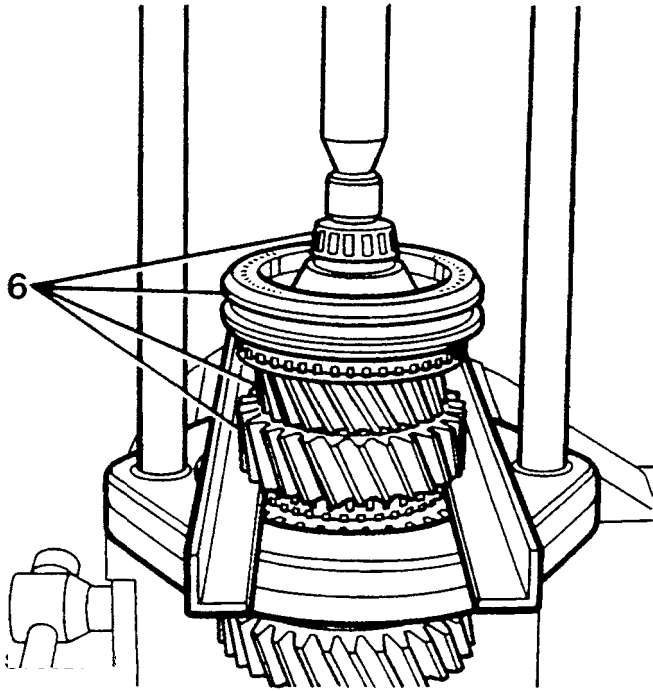
- With MS 47 press first gear assembly from mainshaft.



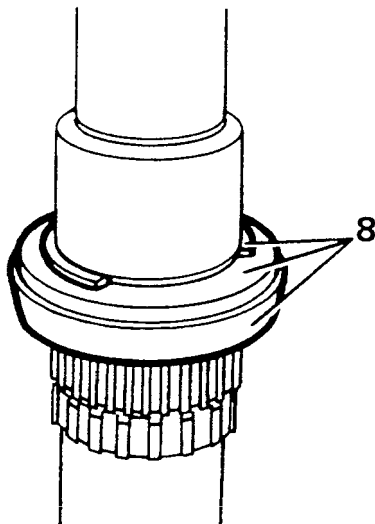
- Remove taper bearing, bush, needle bearing, first gear spacer, cone, inner and outer baulk rings.
- Remove circlip to release first and second gear synchromesh assembly.



5. Remove first and second synchromesh baulk rings.
6. Using MS 47 and support bars under second gear, press off pilot bearing, third, fourth synchromesh second and third gear assembly.



7. Remove washer, third, fourth synchromesh, third gear baulk ring, split needle rollers, bush, needle bearing and second gear.
8. Remove snap ring, spacer, second gear cone and circlip.



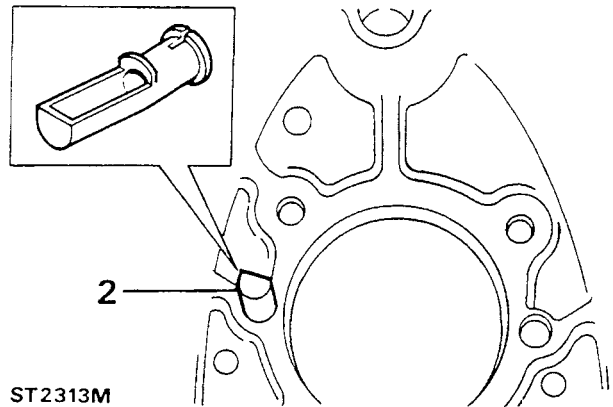
ST3234M

**GEARBOX CASINGS AND OIL PUMP**

Degrease and clean all components and discard gaskets and seals.

**Gearbox casing**

1. Remove mainshaft and layshaft bearing tracks.
2. Remove plastic scoop from inside the casing.

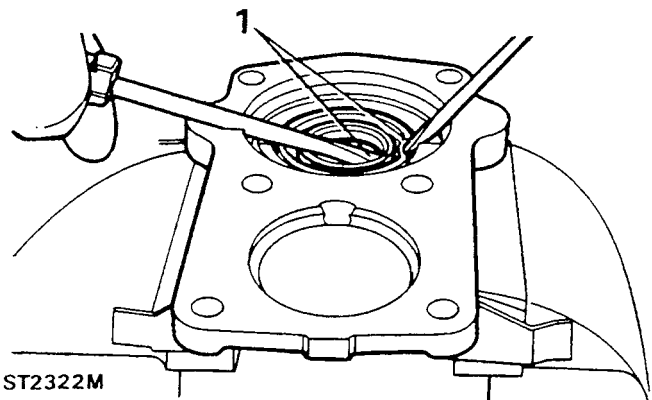


ST2313M

3. Inspect case for damage, cracks and stripped threads.
4. Fit a new scoop with scoop side towards top of casing.

**Front cover**

1. Remove oil seal from cover. Do not fit a new seal at this stage

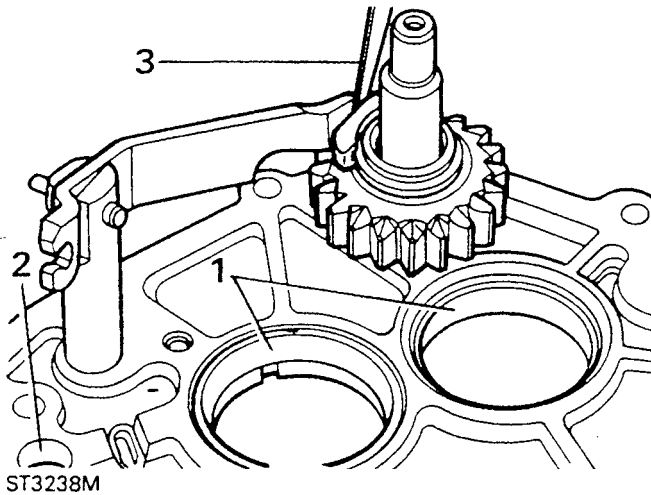


ST2322M



**Centre plate**

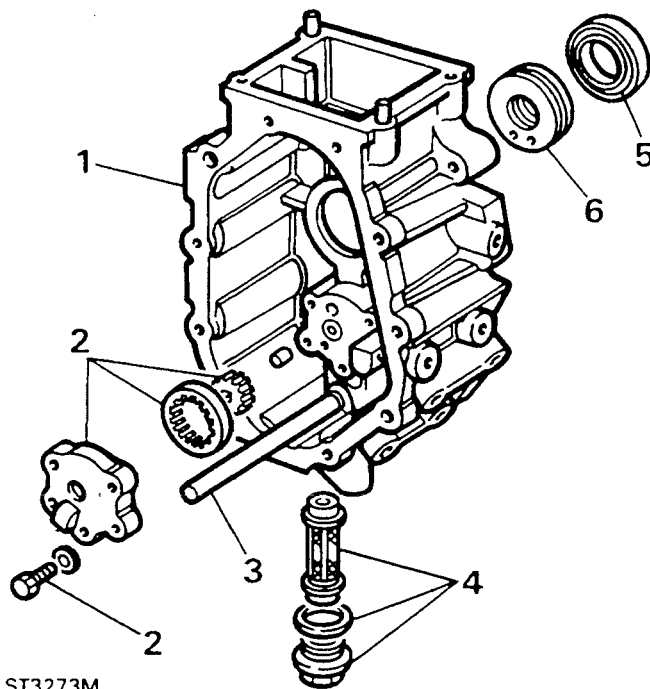
1. Remove bearing tracks.
2. Inspect for damage and selector rail bore for wear.
3. Temporarily fit reverse shaft gear and lever and check clearance between slipper and lever does not exceed 0,20 mm (0.008 in).



ST3238M

**Extension case**

1. Examine for damage to threads and machined faces.
2. Remove oil pump cover, inspect gears and housing and renew if required.



ST3273M

3. Check oil pick up pipe for obstruction but do not remove.
4. Remove drain plug assembly. Clean and renew filter and washers if necessary.
5. Renew oil seal.
6. Renew Ferrobestos bush.

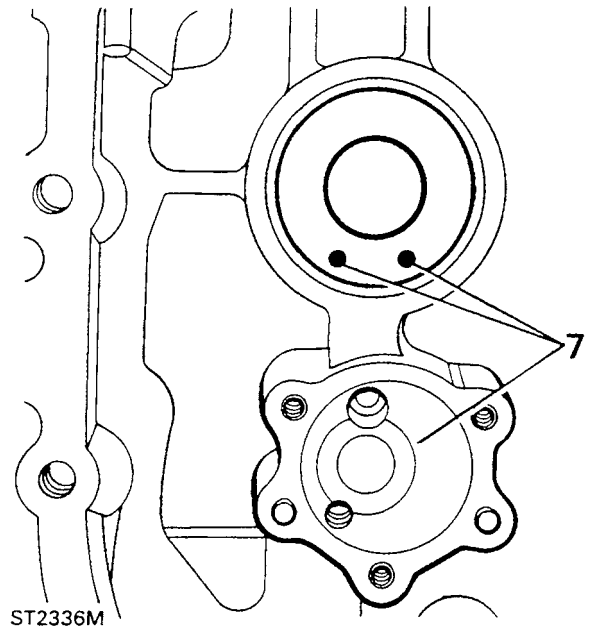


**WARNING: This bush contains abestos. Do not attempt to clean it. see INTRODUCTION, Information, Poisonous substances.**

7. Fit new bush with drain holes towards bottom of casing.

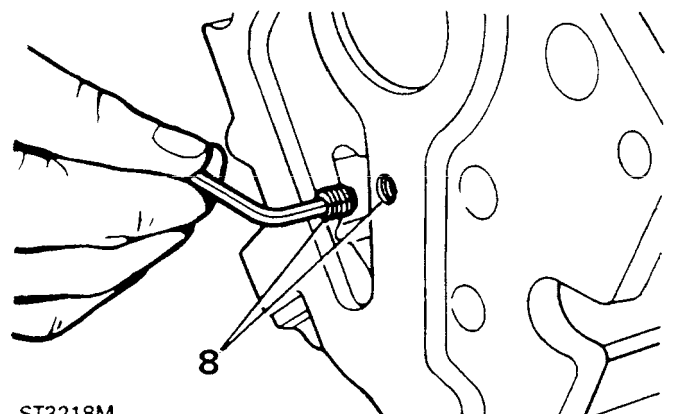


**CAUTION: If drain holes are not positioned correctly oil may build up behind oil seal and cause a leak.**



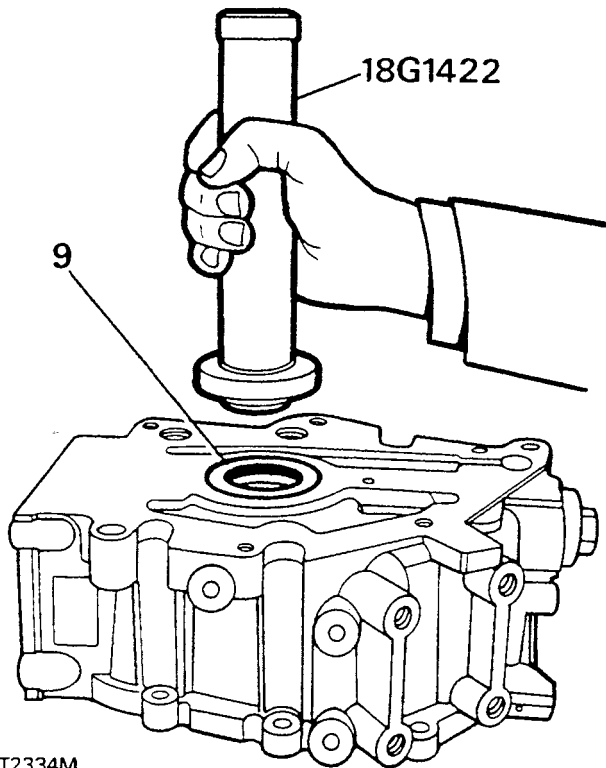
ST2336M

8. If extension housing is being renewed transfer grub screw to new housing. Apply Loctite to threads.



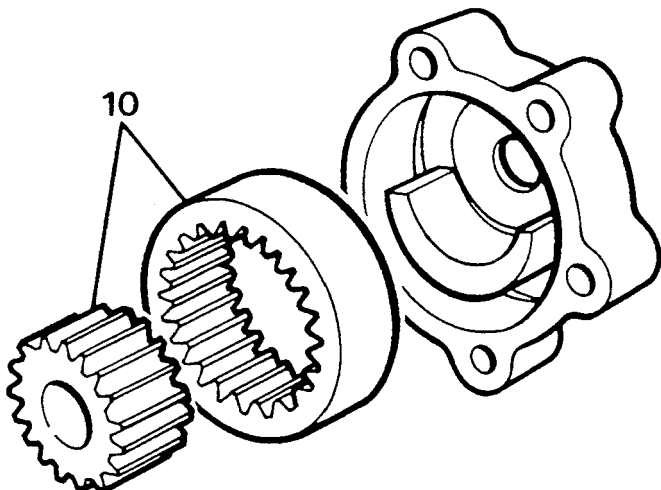
ST3218M

- Fit oil seal to housing, lip side leading, using 18G 1422. Apply SAE 40 oil to lip.



ST2334M

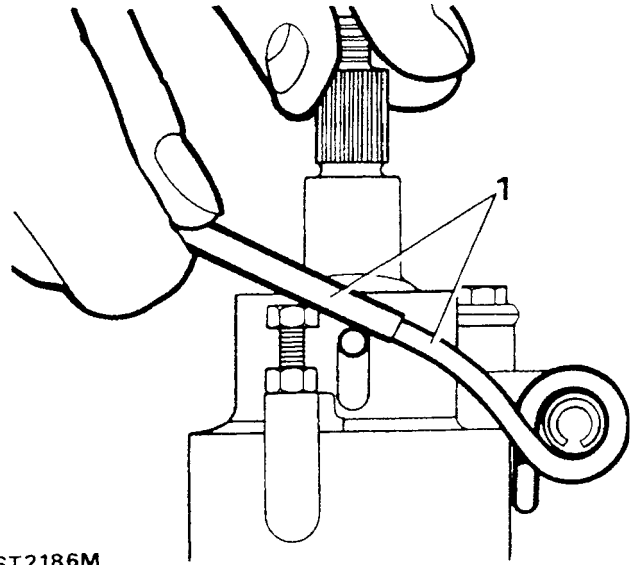
- Assemble gears to oil pump and fit cover.



ST3254M

**GEAR CHANGE HOUSING**

- With a length of tube, release the bias spring from adjusting screws.
- Remove bias spring adjusting screws.



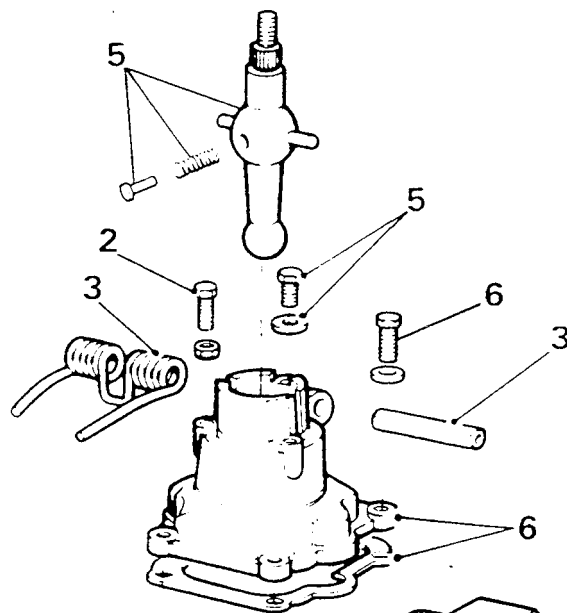
ST2186M

- Drive-out roll pin to remove bias spring.
- Remove gear lever extension from lower gear lever.
- Remove bolt and special washer to remove lower gear lever.



**WARNING:** Hold the nylon spring loaded pad while removing the lever to prevent it causing personal injury.

- Remove gear selector housing from remote housing.



ST2182M

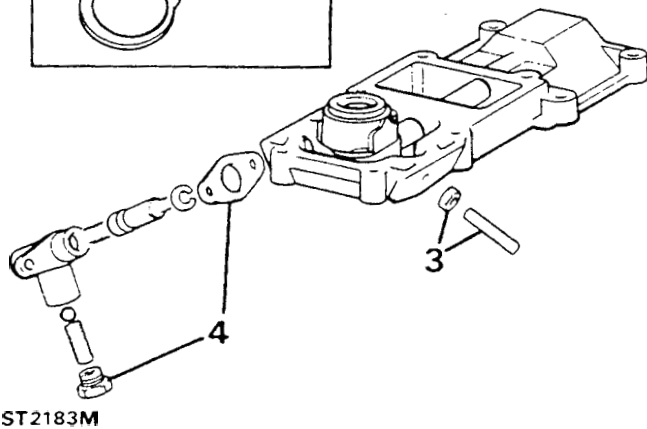
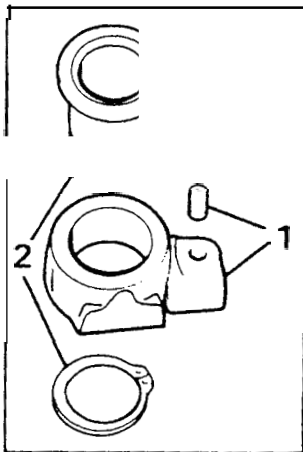


7. Clean and examine all components and renew where necessary.
8. Assemble above parts in reverse order using multi-purpose grease on gear lever.

^ **NOTE: Ensure spring loaded pad is properly located and that the lever is fitted to the housing with the pad on the opposite side to the bias spring. Leave bias spring adjusting screws slack until assembly of gearbox.**

**Remote gear lever housing.**

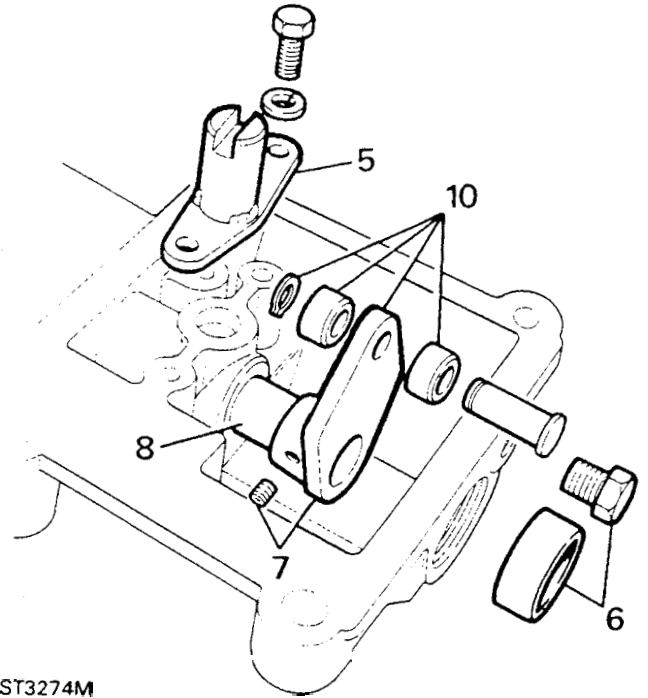
1. Release socket headed screw to remove trunnion.
2. Remove circlip to release seating from trunnion.
3. Remove fifth gear locknut and stud.
4. Remove reverse gear plunger and shim.



ST2183M

5. Remove fifth gear spool guide.
6. Remove blanking plug.
7. Drift-out roll pin securing quadrant to shaft.
8. With selector through hole.
9. Remove selector shaft "O" ring.

10. Remove circlip to release rollers and pin from quadrant.

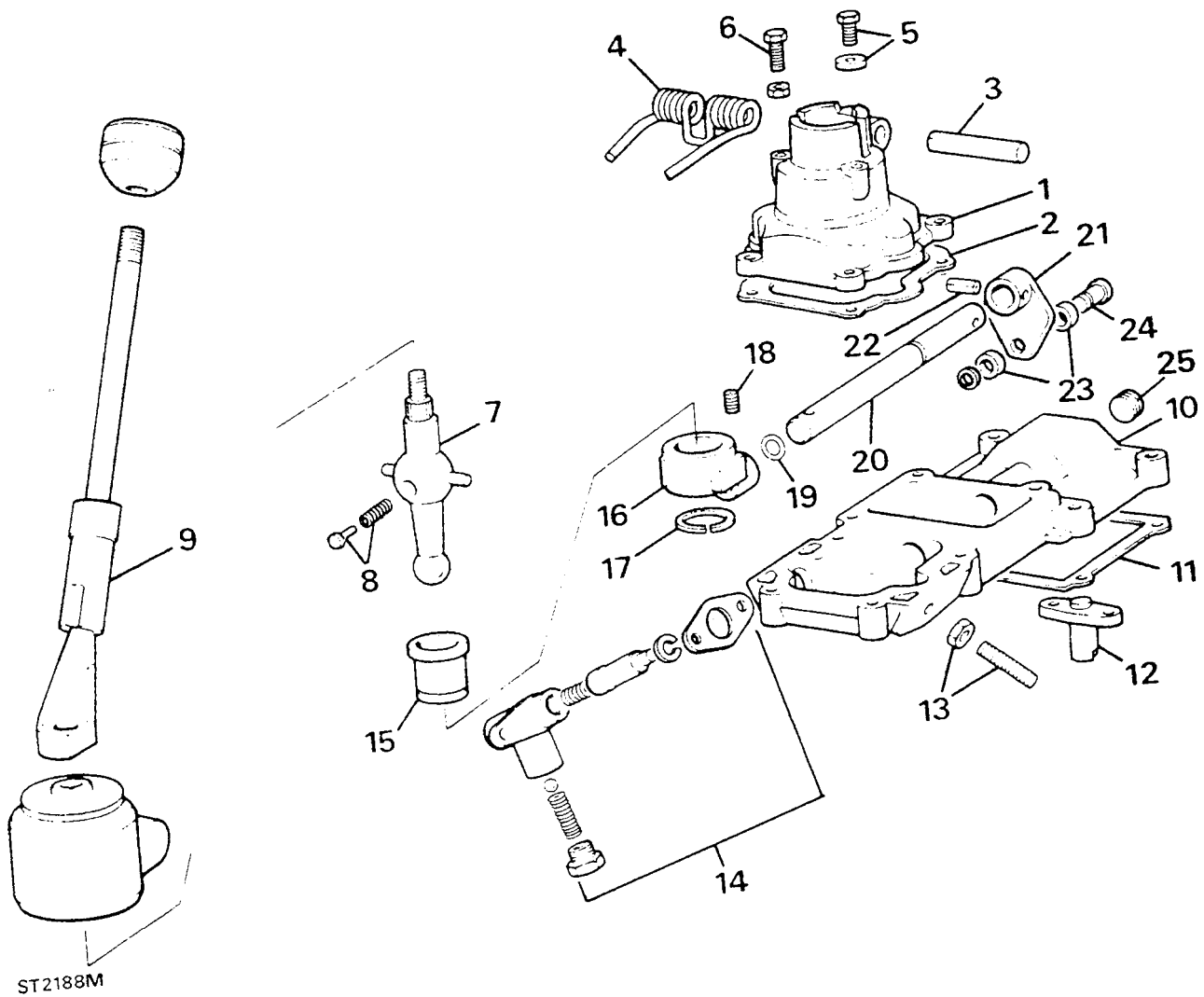


ST3274M

11. Clean and examine all components and renew where necessary.
12. Assemble housing by first fitting "O" ring to shaft.
13. Fit quadrant and secure with roll pin.
14. Fit rollers and secure with circlip.
15. Fit fifth gear spool retainer and apply Loctite 290 to bolt threads.
16. Apply Loctite 290 to reverse switch threads.
17. Fit seating to trunnion and secure with circlip.
18. Fit trunnion to shaft and apply Loctite to retaining screw threads.
19. Fit reverse gear plunger and original shims.
20. Fit fifth gear stud stop and locknut.
21. Fit new bucket plug with Hylomar PL 32.
22. Fit gear selector housing to remote housing.

## 37 MANUAL GEARBOX

## GEAR SELECTOR HOUSING



ST2188M

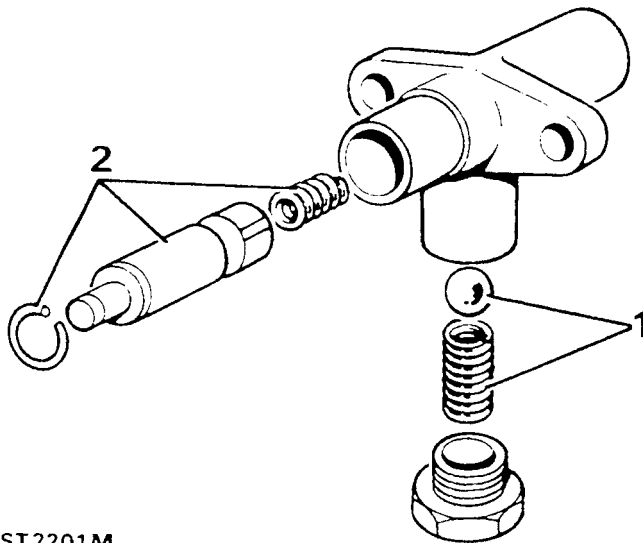
1. Gear selector housing
2. Gasket
3. Roll pin
4. Bias spring
5. Gear lever retaining screw and washer
6. Selector housing screws
7. Gear lever
8. Nylon pad and spring
9. Gear lever extension
10. Remote housing
11. Gasket
12. Fifth gear spool guide
13. Fifth gear stop screw and lock nut
14. Reverse gear plunger
15. Gear lever seating
16. Trunnion
17. Circlip
18. Trunnion retaining screw
19. 'O' ring
20. Selector shaft
21. Quadrant
22. Roll pin
23. Rollers
24. Pin
25. Blanking plug





### Reverse gear plunger assembly.

1. Remove plug spring and ball.
2. Remove circlip to release plunger and spring.
3. Clean and examine components.
4. Assemble plunger and spring with multi-purpose grease and secure with circlip.
5. Lubricate and fit detent ball and spring with light oil. Apply Loctite 290 to plug threads and fit.
6. Check that plunger returns when depressed.



ST2201M

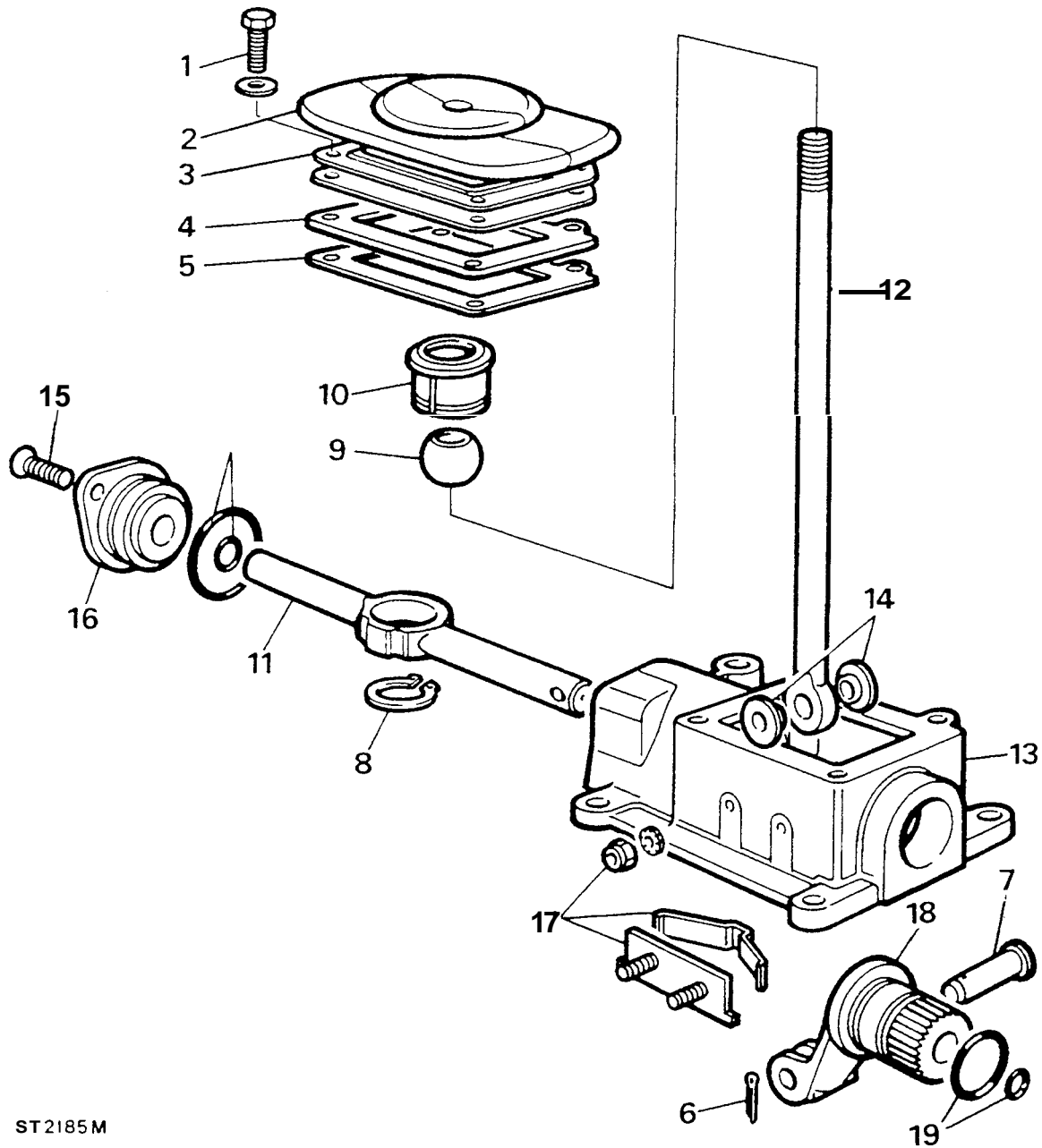


**NOTE:** Assemble the housing using multi-purpose grease on all moving parts.

9. Fit internal and external "O" rings to fork assembly.
10. Fit detent spring.
11. Fit "O" rings to end cover and fit to short end of cross shaft.
12. Insert shaft into fork and secure end cover with screws.
13. Fit Nylon seat, groove downwards, to gear lever.
14. Fit gear lever and seat to cross shaft and secure with circlip.
15. Fit bushes to gear lever and secure with clevis pin and split pin.

### Transfer gear housing.

1. Remove the four screws and remove gaiter assembly.
2. Disconnect the gear lever from selector fork.
3. Retrieve the non metallic bushes.
4. Remove circlip to release ball and seat and withdraw gear lever.
5. Remove screws from end cover to withdraw cover and cross shaft.
6. Remove selector fork.
7. Remove detent spring and plate.
8. Clean and examine all parts and renew where necessary.



ST2185M

- |                                    |                              |
|------------------------------------|------------------------------|
| 1. Gaiter retaining screw - 4 off, | 11. Cross shaft.             |
| 2. Gaiter.                         | 12. Gear lever.              |
| 3. Gaiter support plate.           | 13. Gear change housing.     |
| 4. Gate plate.                     | 14. Non-mettalic bushes.     |
| 5. Gasket.                         | 15. Counter sunk screws.     |
| 6. Split pin.                      | 16. End cover.               |
| 7. Clavis pin.                     | 17. Detent spring and plate. |
| 8. Circlip retaining Nylon seat.   | 18. Selector fork.           |
| 9. Gear lever ball.                | 19. "O" rings.               |
| 10. Nylon seat.                    |                              |

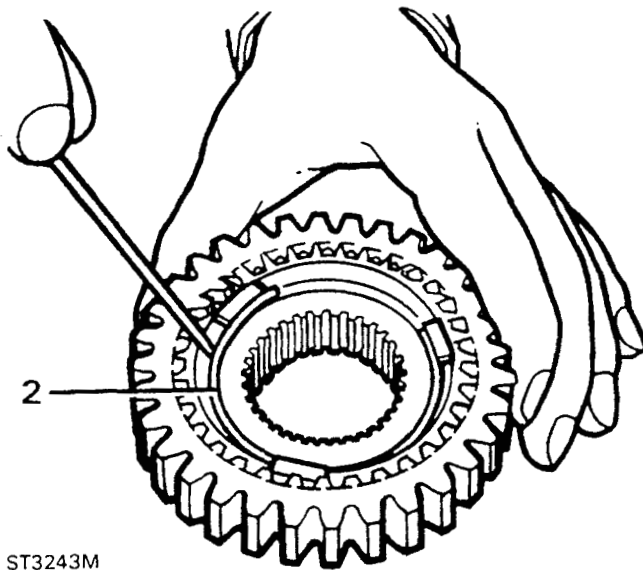


**SYNCHROMESH ASSEMBLIES**

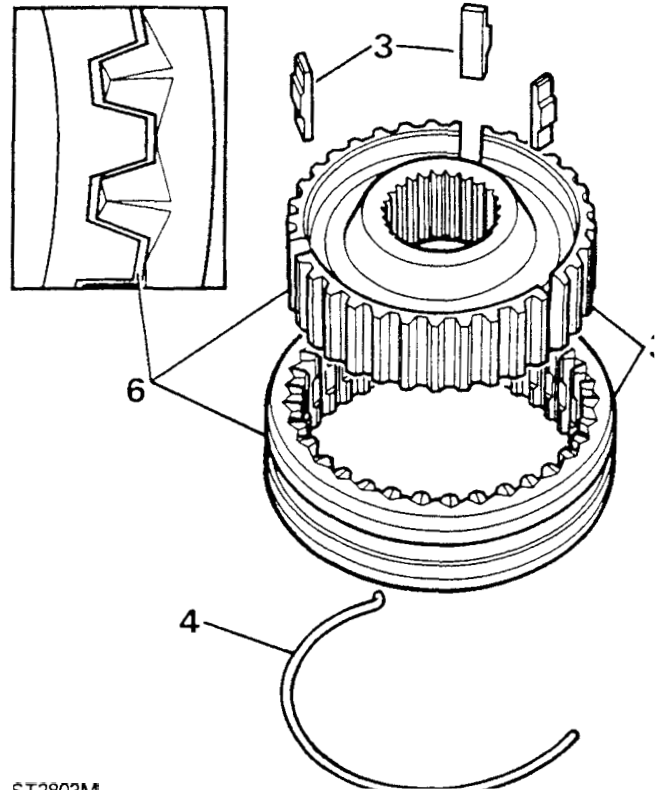
**Third-fourth and fifth gear synchromesh.**

**NOTE:** the above assemblies are the same except that fifth gear synchromesh has a retainer plate.

1. Mark relationship of inner and outer members.
2. Remove wire clip from both sides of assembly.

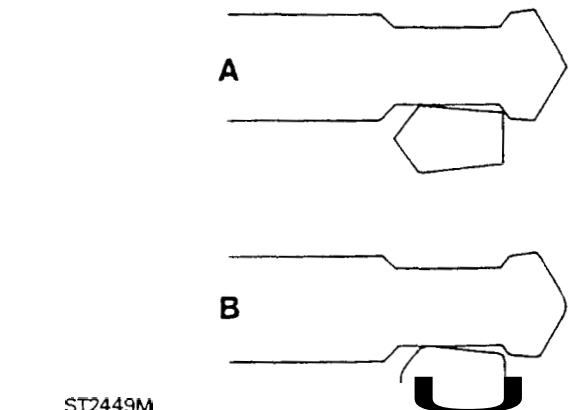


3. Remove slippers and separate the two members.
4. Examine all parts for damage and wear including wire clips for tension.
5. Check no radial movement exists between inner members and mainshaft splines. (except fifth gear synchromesh).
6. Examine inner and outer splines for wear.



7. Examine the dog teeth on all gears for wear and damage.

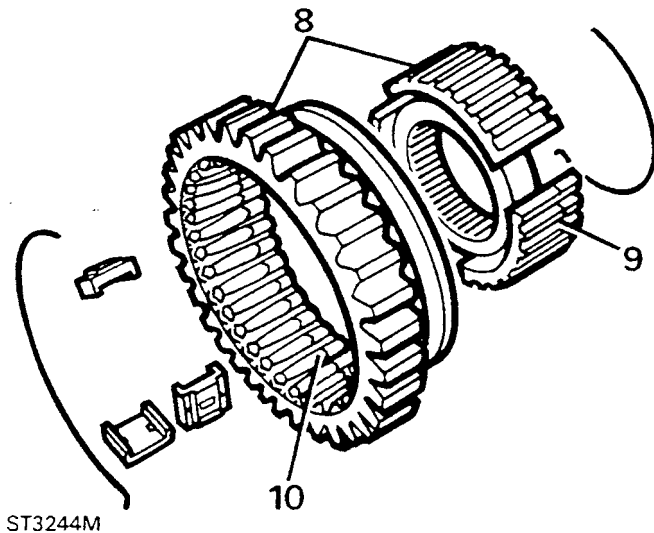
**NOTE:** example "A" shows a tooth in good condition. Example "B" shows the rounded corners of a worn tooth.



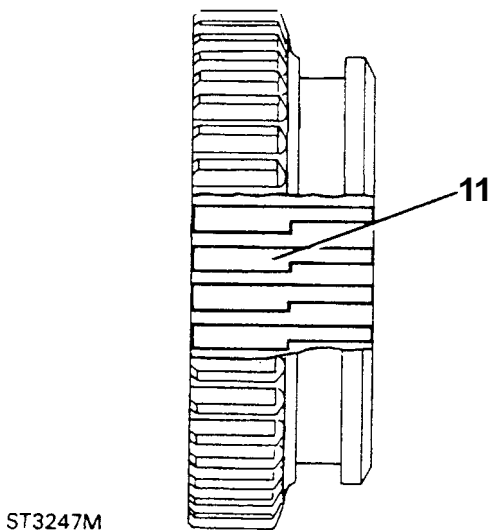
First-second synchromesh

8. Repeat instructions 1 to 6 for third-fourth synchromesh.
9. Examine step in each of outer splines.
10. Check that the step on both sides of the internal splines are sharp not rounded.

△ NOTE: this applies only to splines on selector groove side of member.

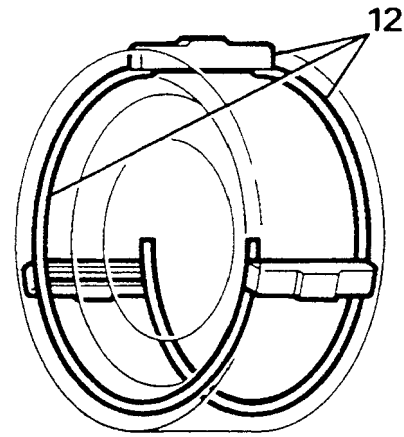


11. Fit inner member to outer so that the wide splines of inner member are under the spur gear teeth.



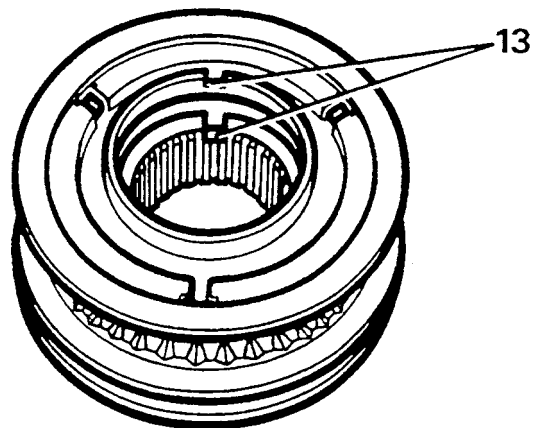
12. Fit the slippers and secure with a spring each side of the synchromesh.

△ NOTE: The hooked end of each spring must locate in the same slipper with the free ends running in opposite directions and resting against the remaining slippers.



13. Assemble third-fourth and fifth gear synchromesh components as in instruction 12.

△ NOTE: The back plate for fifth gear is fitted to the rear of the assembly with the single tag locating in a slot in the inner member.

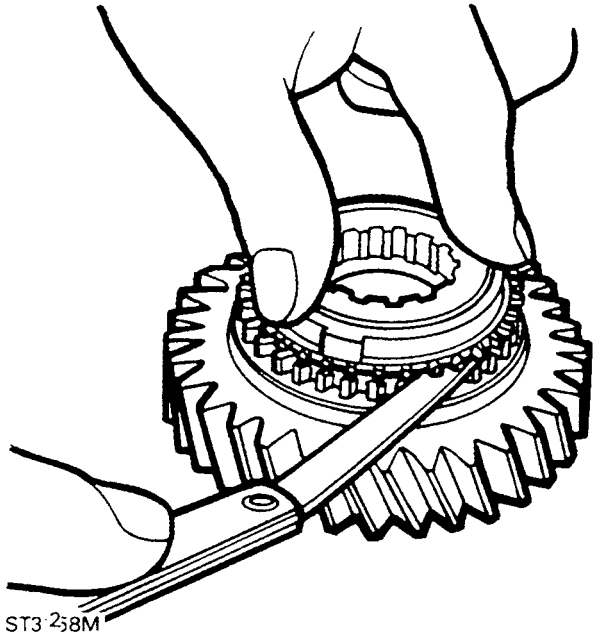




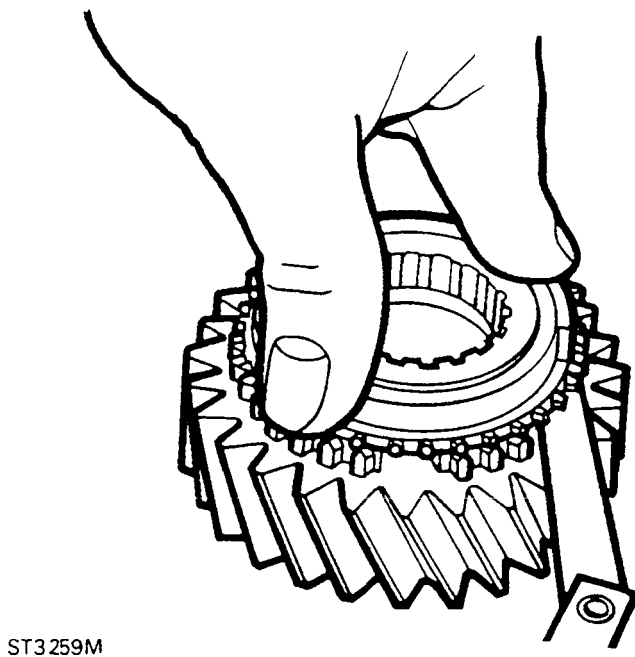
**CHECKING BAULK RING CLEARANCES**

Check clearance of all baulk rings and gears by pressing the baulk ring against the gear and measuring the gap. The minimum clearance should be 0,38mm (0.015in).

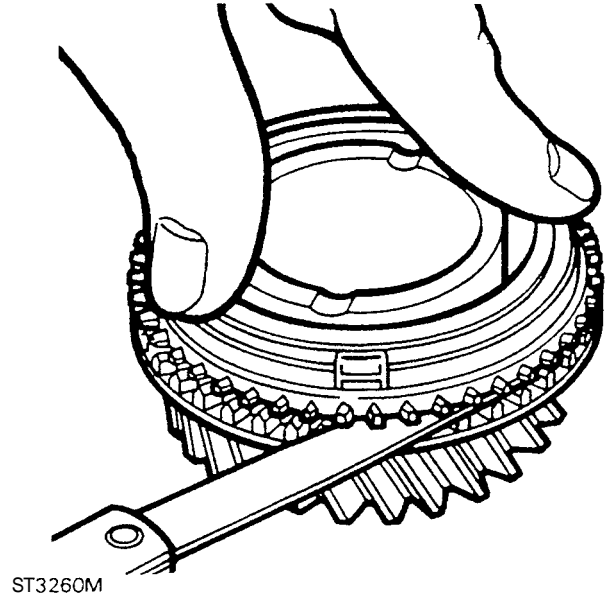
**First gear**



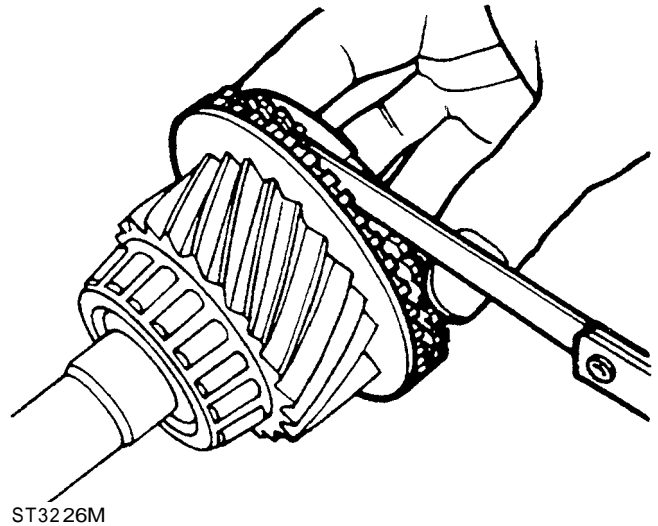
**second gear**



**Third gear**



**Fourth gear**

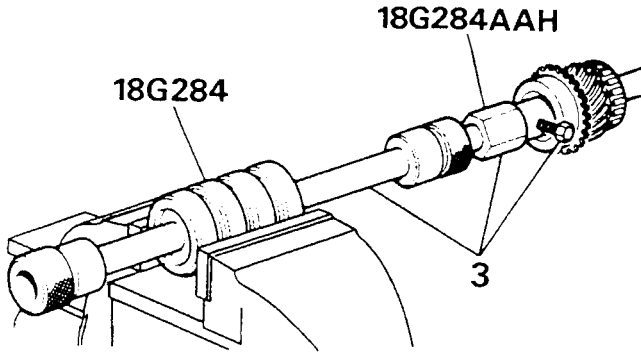


**Fifth gear**



INPUT SHAFT

1. Examine the gear and dog teeth for wear and damage.
2. Polish oil seal track if necessary.
3. Using 18G 284 AAH and 18G 284 remove pilot bearing track.

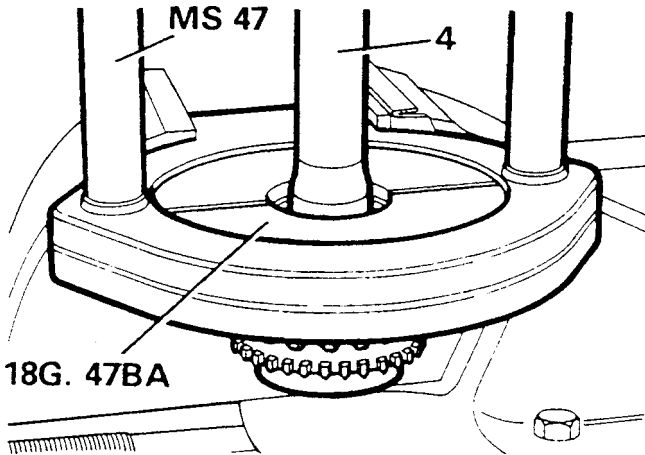


ST3278M

4. Using 18G 47BA and MS 47 remove taper bearing.



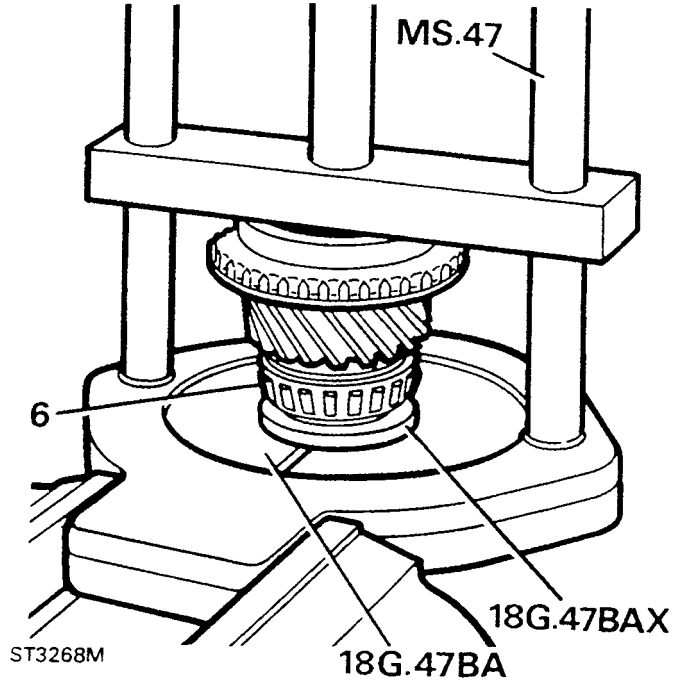
**NOTE:** ensure that the bearing is supported by the lip inside 18G 47 BA.



ST3279M

5. Support the shaft under MS 47 and press in a new track.

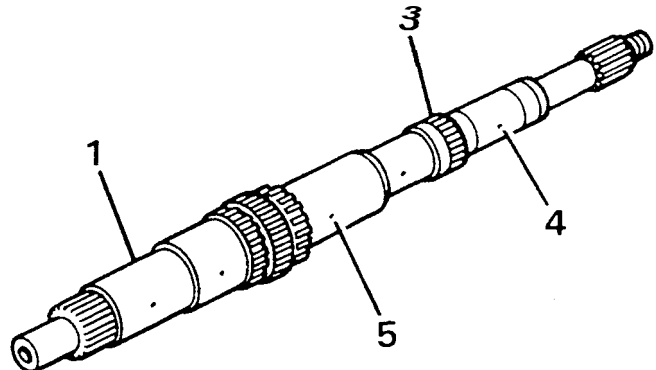
6. Using Press MS 47, Collets 18G 478 and adaptor 18G 47 BAX fit a new taper bearing.



ST3268M

MAINSHAFT

1. Examine bearing journals for wear and scores.
2. Check condition of circlip grooves.
3. Examine splines for wear and damage.
4. Use an air line to check that the main oil feed from the pump is clear and feed to spigot bearing.
5. Check oil feed holes to roller bearings are clear.

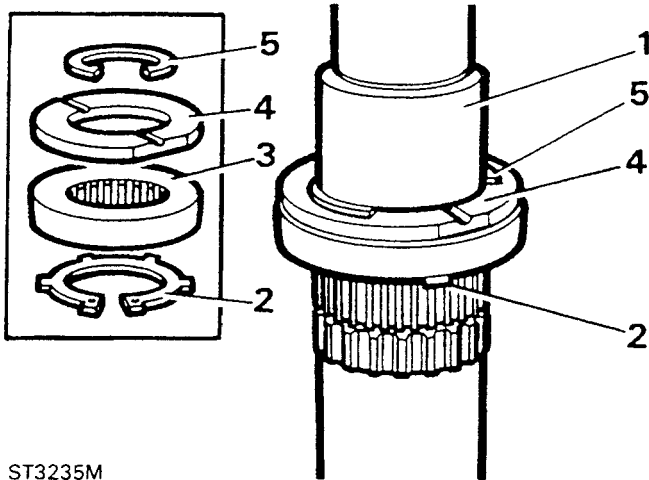


ST3241M



**MAINSHAFT GEAR END FLOAT CHECKS**

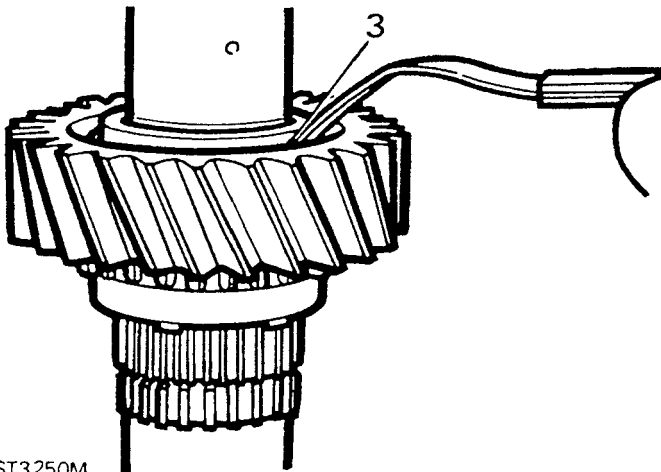
1. Hold mainshaft in vice front end downwards.
2. Fit front circlip for first-second synchromesh.
3. Fit second gear cone.
4. Fit spacer.
5. Fit snap ring.



ST3235M

**Second gear end-float.**

1. Fit needle roller and second gear
2. Fit third gear bush.

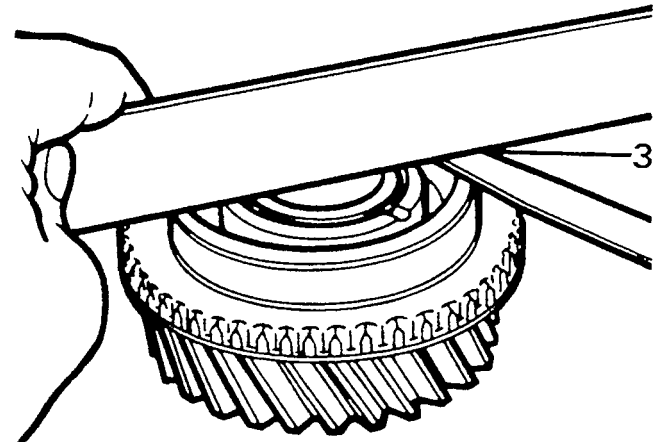


ST3250M

3. Check clearance between second gear and bush flange. Not to exceed 0,20 (0.008in).
4. Remove above components.

**Third gear end-float.**

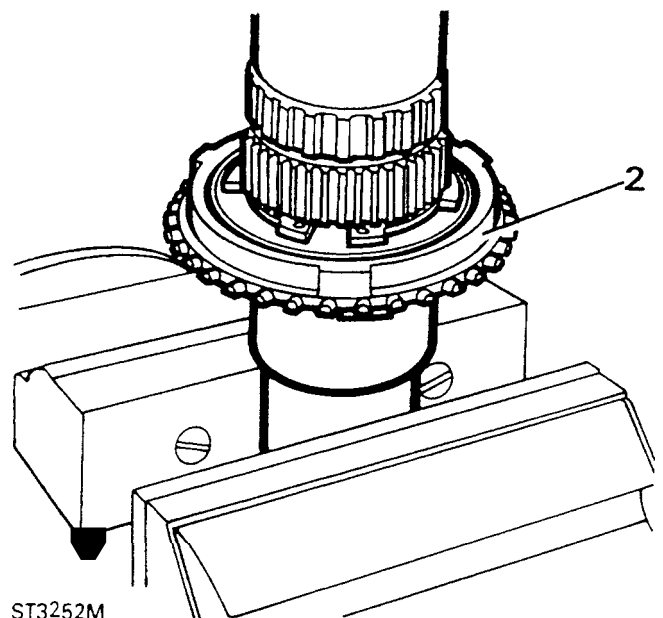
1. Fit needle roller to third gear.
2. fit third gear bush to third gear.
3. Place gear on flat surface, bush flange downwards, and with a straight edge across gear check clearance between straight edge and gear. Not to exceed 0,20 (0.008in).



ST3251M

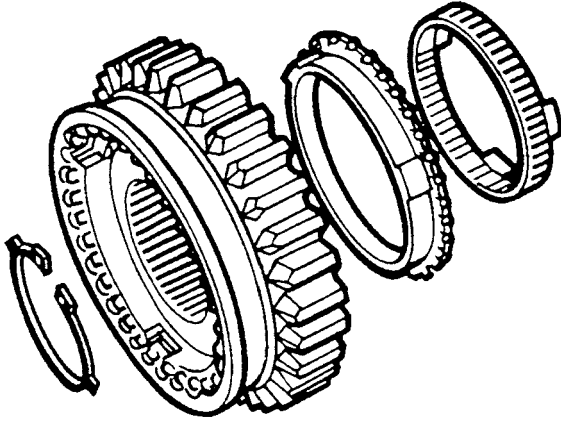
**First gear bush end-float.**

1. Invert mainshaft rear end uppermost.
2. Fit inner and outer second gear baulk rings.



ST3252M

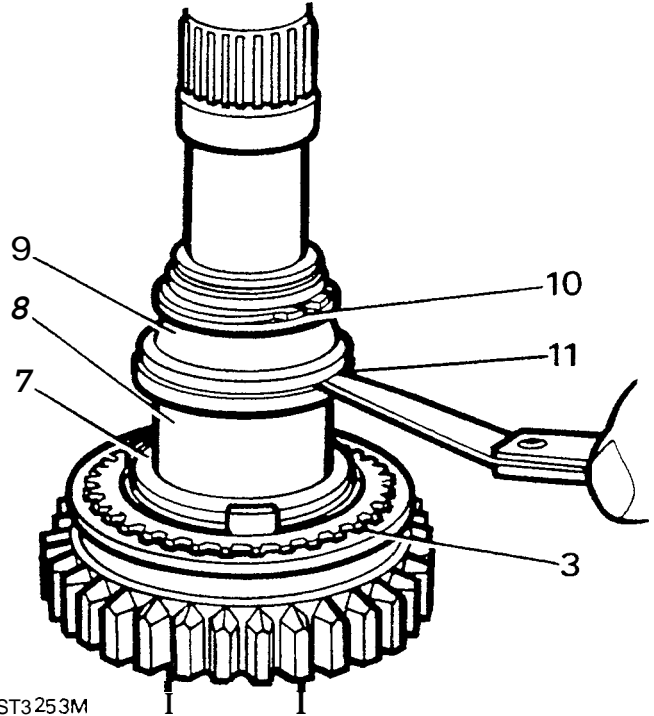
3. Fit first-second synchronesh hub, fork groove uppermost.
4. Fit circlip.



ST3231M

First-second synchronesh assembly

8. Fit first gear bush.
9. Fit dummy bearing.
10. Fit circlip.
11. Check clearance between dummy bearing and bush. Not to exceed 0,75mm (0.003in).
12. Remove circlip, dummy bearing and bush.



ST3253M

Selective first gear bush

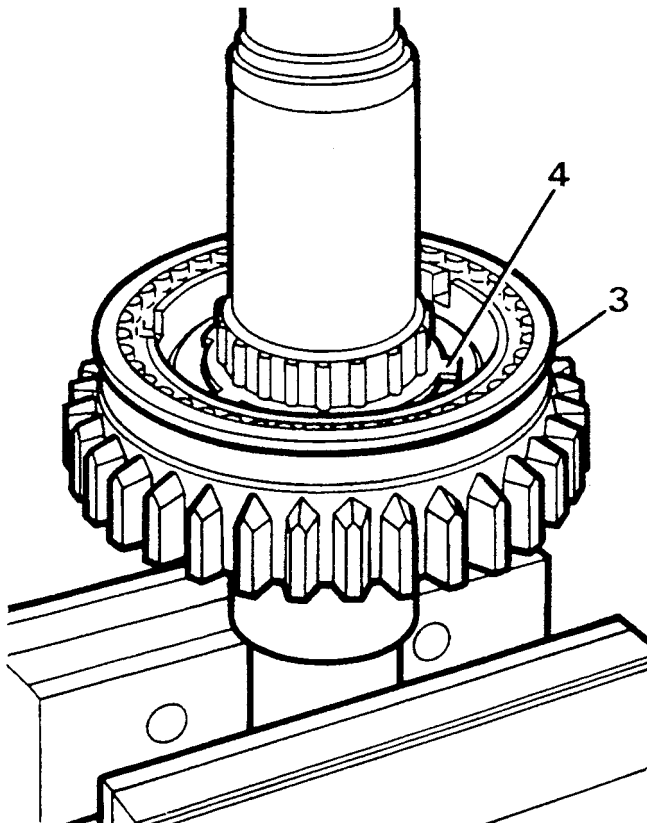
Part number	Thickness
FTC2005	30,905/30,955
FTC2006	30,955/31,005
FTC2007	31,005/31,055
FTC2008	31,055/31,105
FTC2009	31,105/31,155

Check first gear to bush end-float.

1. Fit roller bearing and bush to first gear.
2. Place bush flange side downwards on a raised block on a flat surface.



**NOTE:** the block should be approximately the same diameter as the bush flange so that the gear is suspended and does not rest on the flat surface.



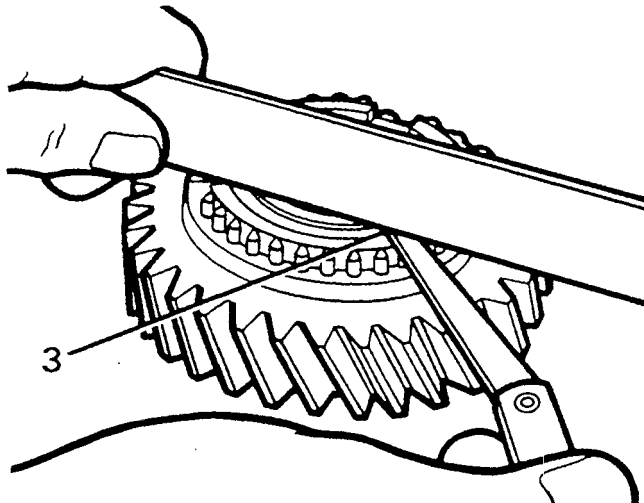
ST3257M

5. Fit first gear inner and outer baulk ring.
6. Fit cone.
7. Fit spacer.

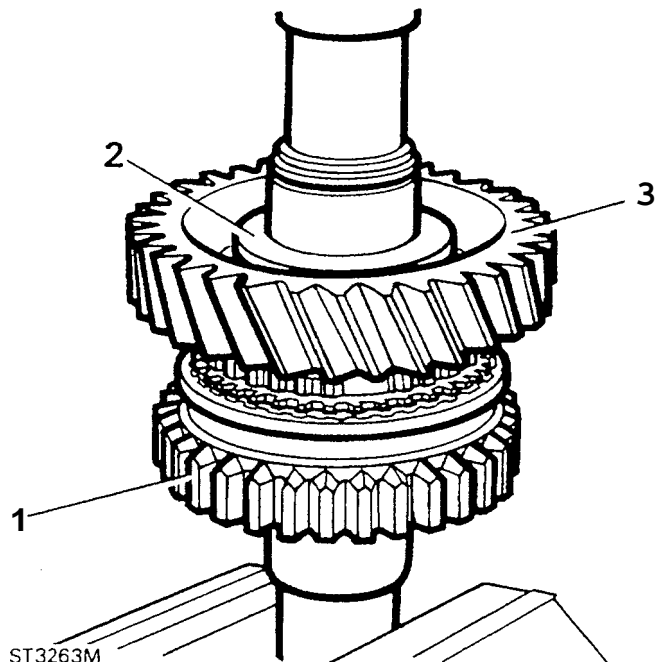




- Place straight edge across gear and check clearance between gear and straight edge. Not to exceed 0,20mm (0.008in).



ST3255M

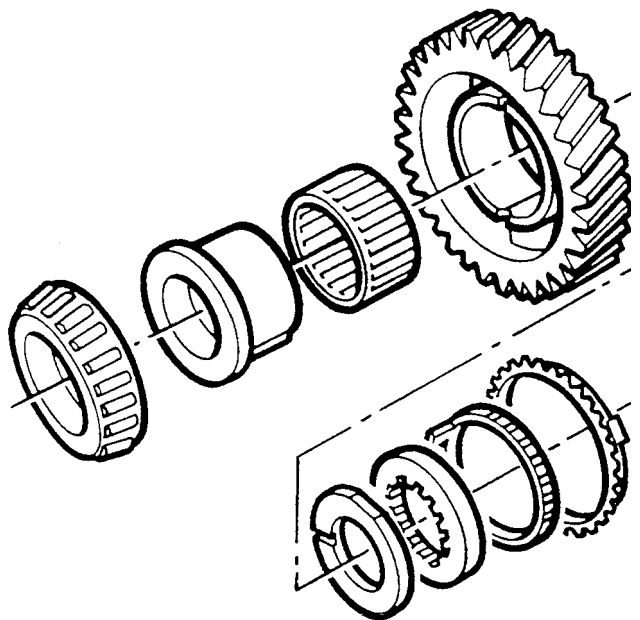


ST3263M

**ASSEMBLING MAINSHAFT**

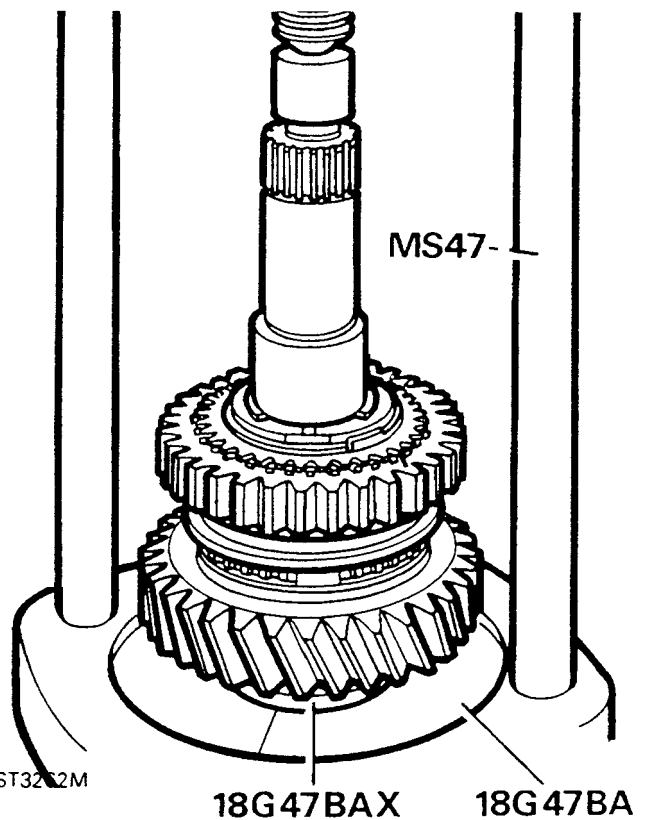
- With the first-second synchromesh hub and spacer in position, assemble the rear end of the shaft.
- Fit the roller bearing and bush to first gear.
- Fit first gear to mainshaft.

- Fit the taper bearing to mainshaft using MS 47, collets 18G 47 BA and adaptor 18G 47 BAX.



ST3229M

First gear assembly



ST3262M

MS47-

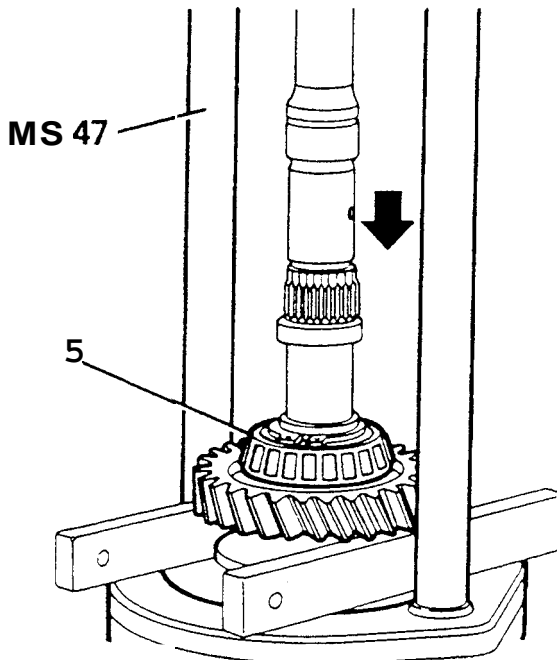
18G47BAX

18G47BA



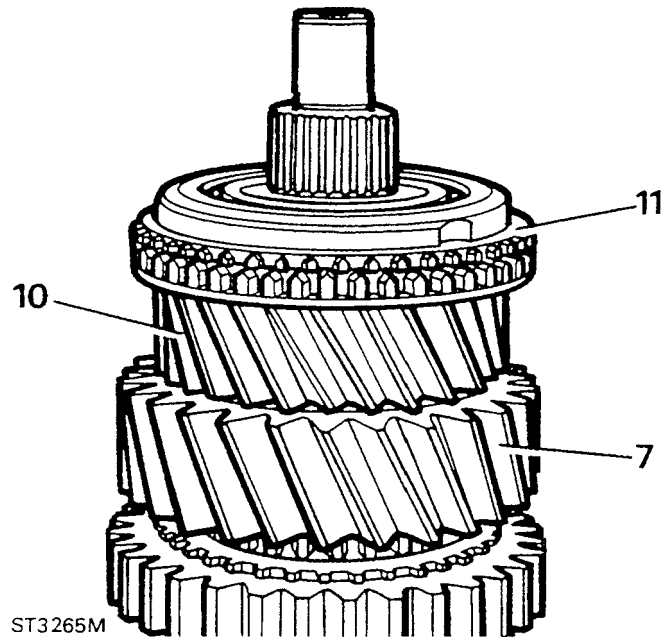
**CAUTION:** Ensure that the slots in the baulk ring align with the synchromesh slippers while pressing on the bearing.

5. Invert mainshaft and press assembly back against circlip.



ST3264M

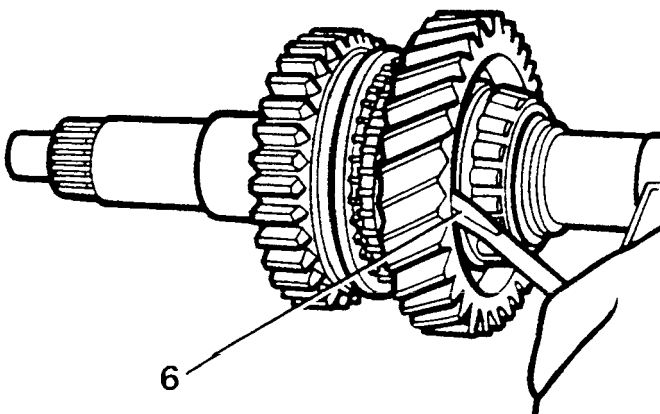
7. Position mainshaft in vice, rear end downwards and fit second gear needle roller, and second gear.
8. Fit third gear bush.
9. Fit third gear needle rollers.
10. Fit third gear.
11. Fit third gear baulk ring.



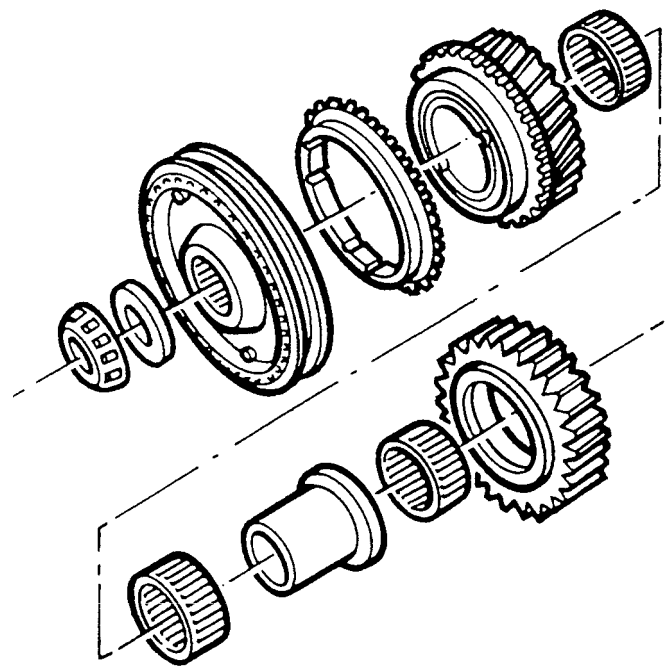
ST3265M

**NOTE:** Instruction 5 is necessary since it is probable that when pressing on the bearing it will have clamped the first gear bush preventing it from turning.

6. Reposition mainshaft in vice and using a screw driver blade check that the first gear bush is free to turn.



ST3256M

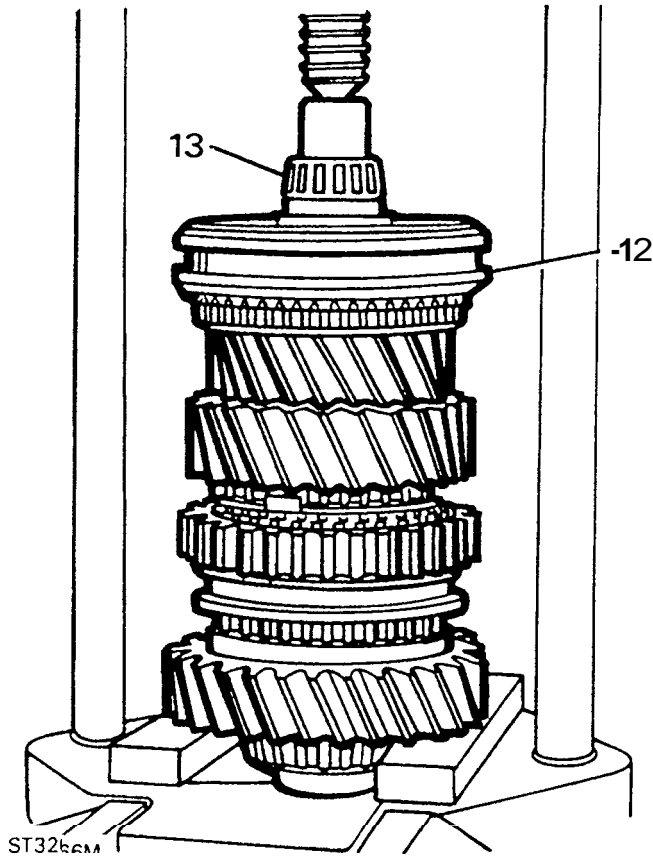


ST3233M

Third-fourth synchromesh assembly

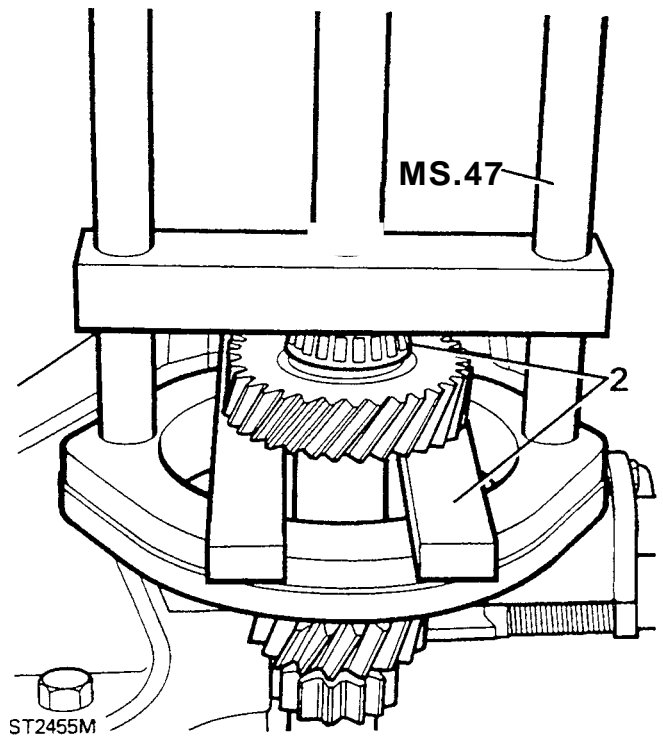


12. Fit third-fourth gear synchromesh hub.
13. Using MS 47 with supports under first gear, press the spigot bearing on to shaft.



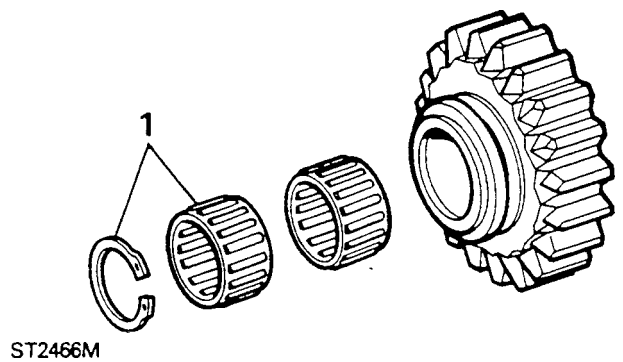
**LAYSHAFT**

1. Examine the layshaft for wear and damage.
2. Press bearings on to layshaft using MS 47 and supporting bars.



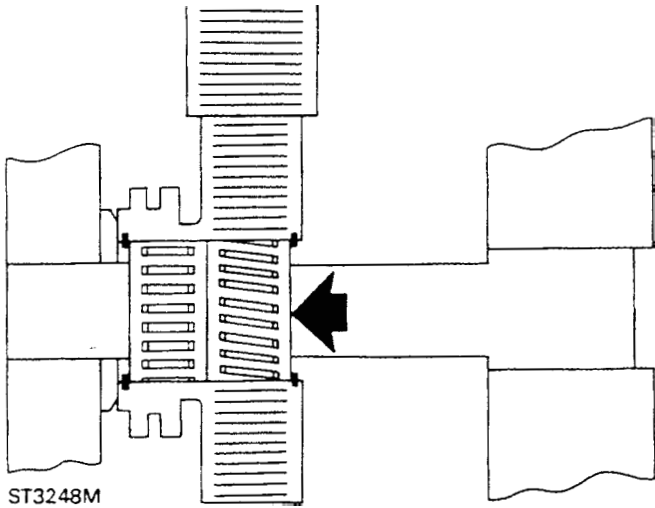
**REVERSE GEAR AND SHAFT**

1. Remove one circlip from the idler gear and remove bearings.

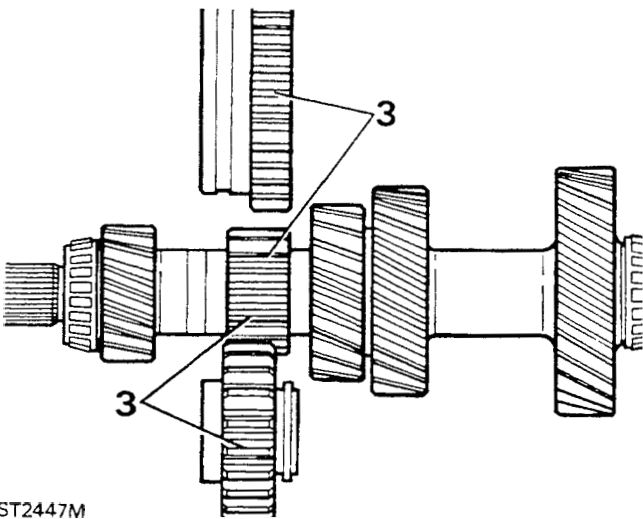




**NOTE:** One bearing cage is twisted in manufacture. The twist causes the gear to tilt on the shaft forcing the gear into engagement. Renew bearings if worn or if the gear jumps out of engagement.



2. Fit the bearings either way round and secure with the circlip.
3. Check condition of idler gear and mating teeth on layshaft and synchromesh outer member.



4. Examine idler shaft for wear, scores and pitting.

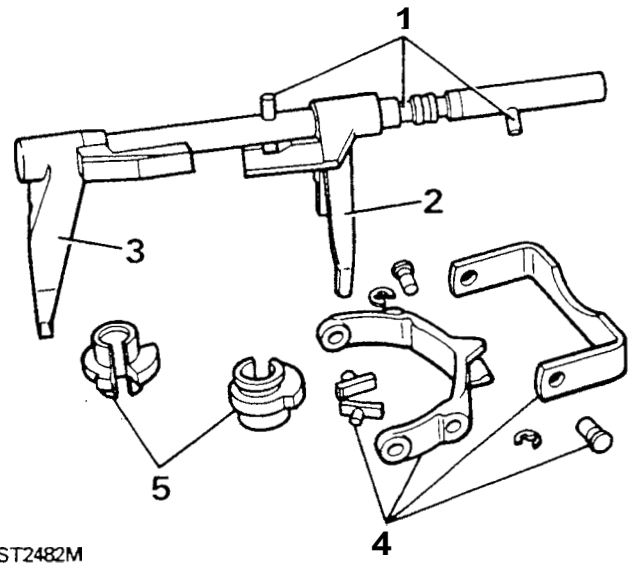
**SELECTORS**

1. Examine selector rail and pins for wear and damage.
2. Examine first-second selector fork for wear cracks and damage.



**NOTE:** The the selector rail and fork is only supplied as a complete assembly.

3. Examine third-fourth selector fork for wear, cracks and damage.
4. Examine fifth gear selector fork, pads and pivot pins.
5. Examine interlock spools for wear and damage.

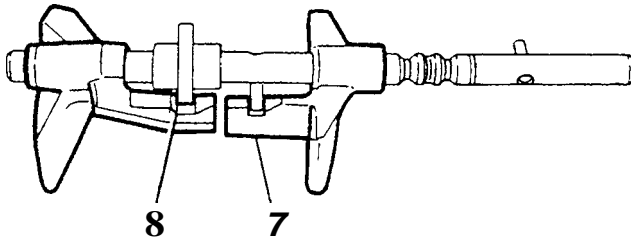


6. Renew retaining circlips if distorted.



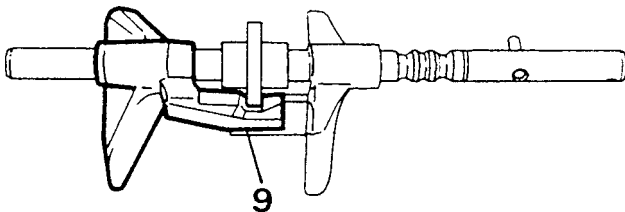
**Assembling selectors.**

7. Rest first-second fork and shaft assembly on bench and locate pin in jaw of fork.
8. Fit interlock spool and third-fourth fork and engage spool in jaw of fork.



ST2488M

9. Slide spool and fork towards first- second selector until slot in spool locates over pin keeping the spool engaged in third-fourth fork jaw.

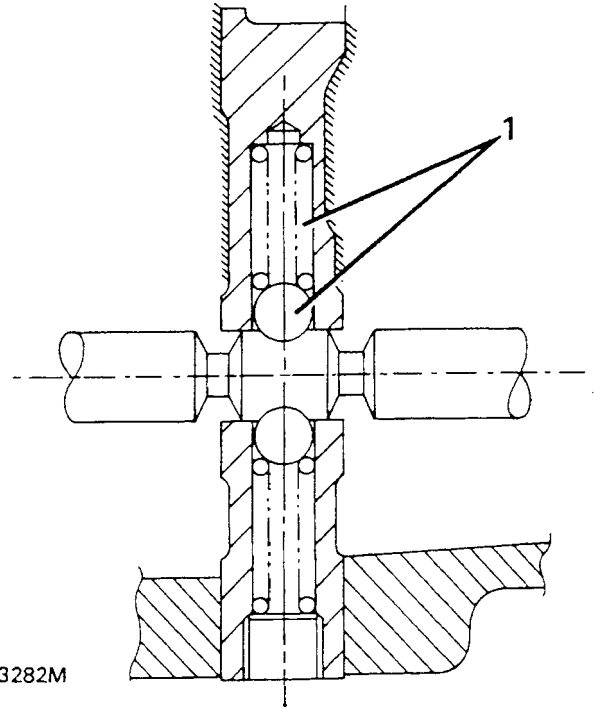


ST2487M

**ASSEMBLING GEARBOX SHAFTS TO CENTRE PLATE**

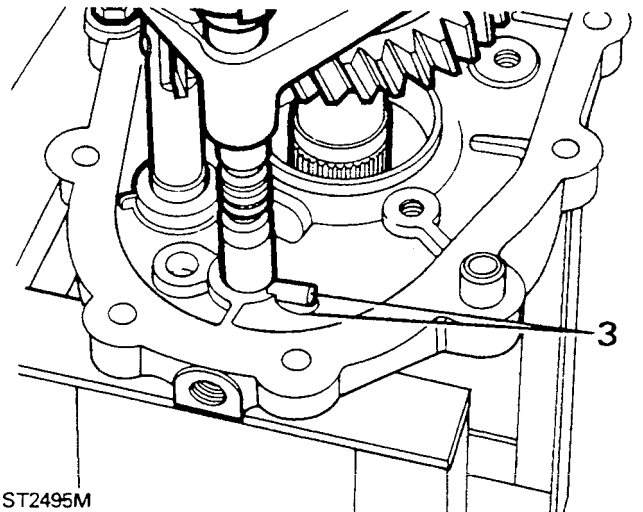
**Fitting gears to centre plate**

1. Secure centre plate to workstand, fit bearing tracks and inboard detent ball and spring.



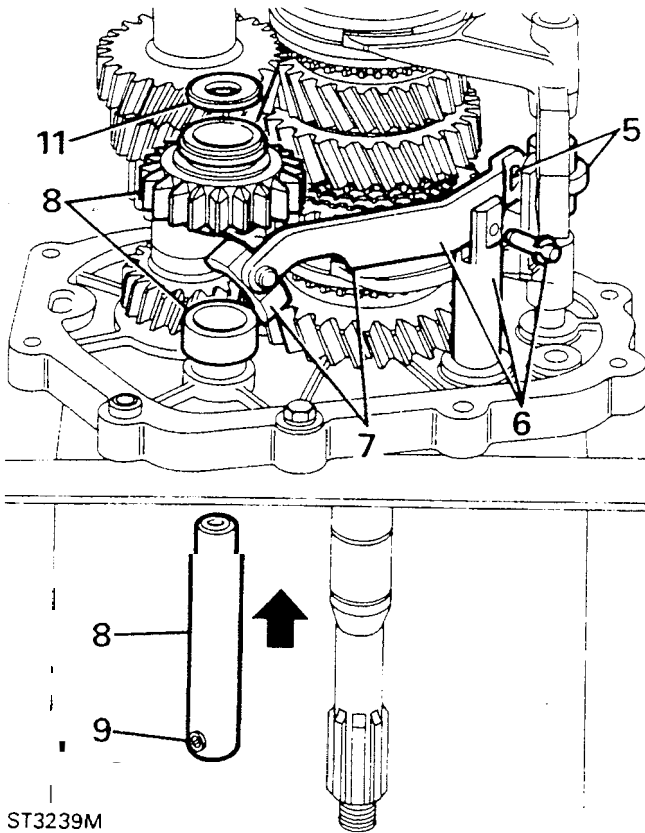
ST3282M

2. Check both synchromesh units are in neutral and fit selector shaft assembly.
3. Fit mainshaft and selectors to centre plate and align pin with slot in plate.



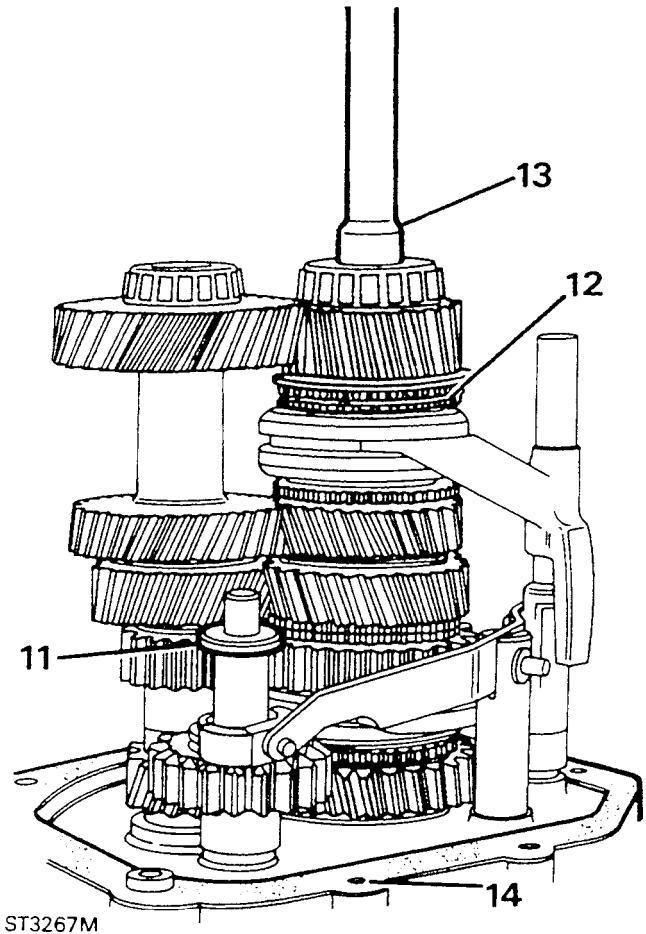
ST2495M

4. Fit layshaft While lifting mainshaft to clear layshaft rear bearing.
5. Turn selector shaft and interlock spool to allow reverse lever to engage spool flange.
6. Fit reverse lever to pivot post and secure with pin and circlip.
7. Fit slipper pad to lever.
8. Fit reverse gear shaft, spacer and gear.
9. Fit slipper to reverse gear and ensure roll pin in shaft engages in slot in centre plate.

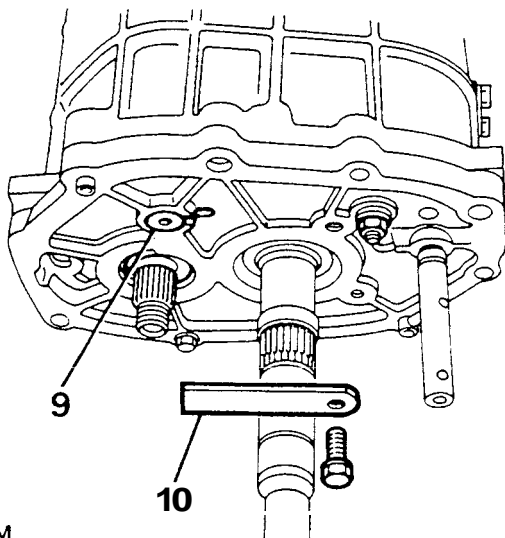


ST3239M

10. Secure reverse shaft with manufactured tool "A".
11. Fit reverse gear thrust washer to shaft.
12. Fit fourth gear baulk ring.
13. Lubricate spigot bearing and fit input shaft.
14. Remove centre plate workstand bolt and fit gasket.



ST3267M

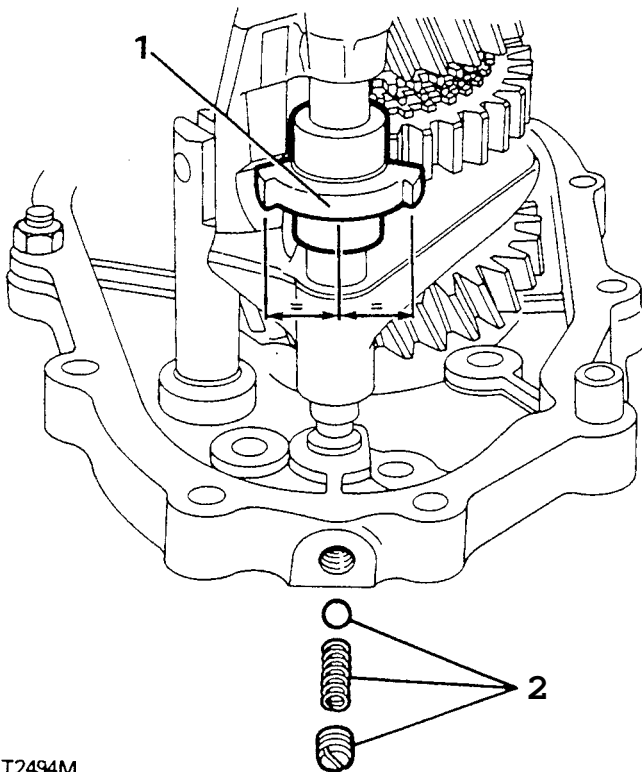


ST2492M



**FITTING GEARBOX CASING**

1. Turn selector shaft and spool to neutral position.
2. Fit out-board detent ball and spring and secure with plug.



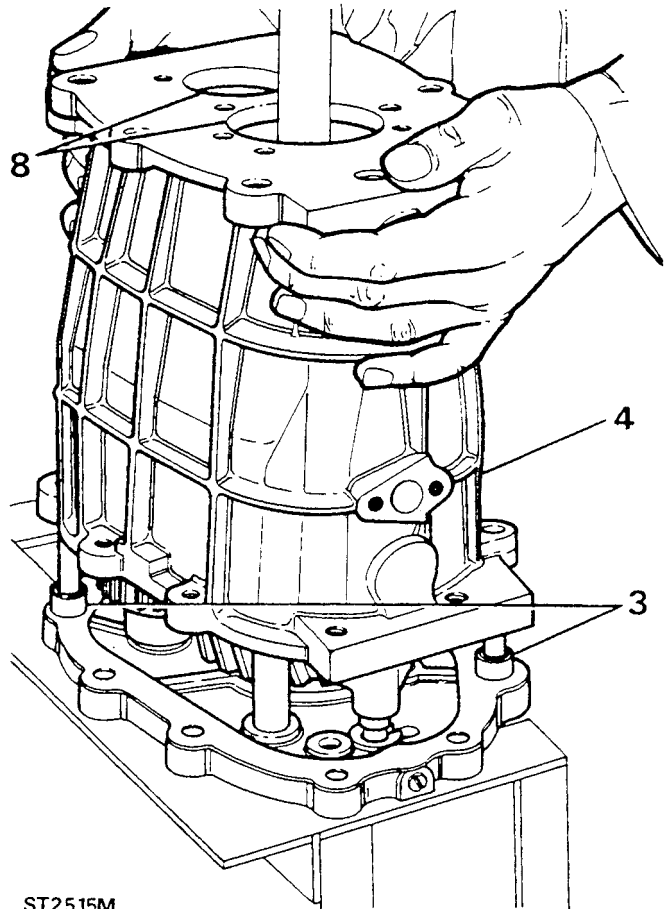
ST2494M

3. Fit guide studs to casing and check oil scoop is correctly fitted.
4. Without using force, fit gearcase.



**NOTE:** Ensure that the centre plate dowels and selector shaft are properly located.

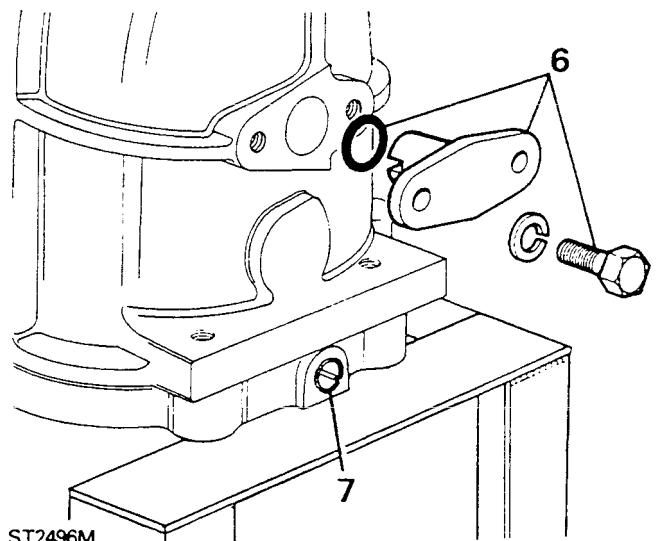
5. Secure centre plate and gearcase to workstand with two 8 x 35mm bolts.
6. Apply PL 32 to joint face and bolt threads and fit spool retainer.



ST2515M

**CAUTION:** Do not use force to fit retainer. Provided the spool has not been disturbed the retainer will slide into position. If not, remove the gear case and reposition spool or shaft.

7. Remove detent plug, apply Loctite 290 or Hylomar PL 32 to thread, refit and stake.
8. Fit layshaft and input shaft bearing tracks.

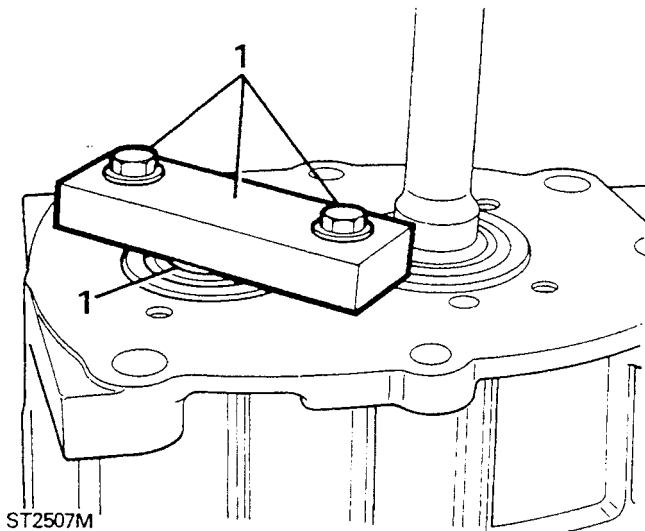


ST2496M

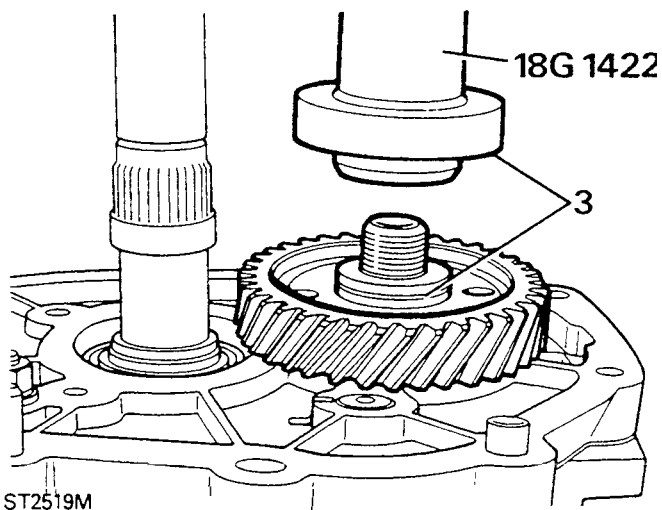
## FITTING FIFTH GEAR

**CAUTION:** Since the fifth gear is a tight fit on the layshaft, the force, when pressing the gear, must not be transferred to the layshaft front bearing. Tool "D" and packing disc should be made to the dimensions given to absorb the force. The plate also retains the input shaft bearing outer track.

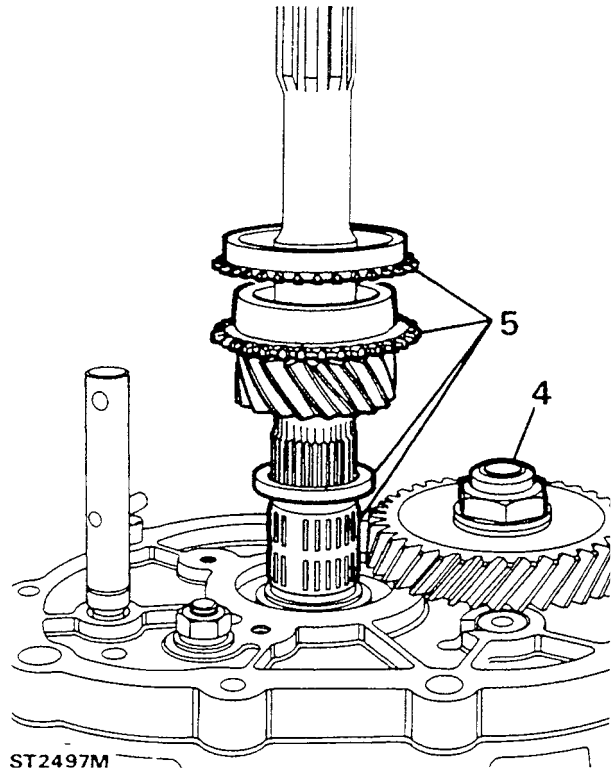
1. Secure the plate with two 8x25mm bolts. Insert disc between plate and layshaft.



2. Release and invert gearbox and remove reverse shaft retainer plate.
3. With the extraction groove uppermost, drive fifth gear on to layshaft using 18G 1422.



4. Fit a new stake nut but do not tighten.
5. Fit fifth gear assembly to mainshaft.



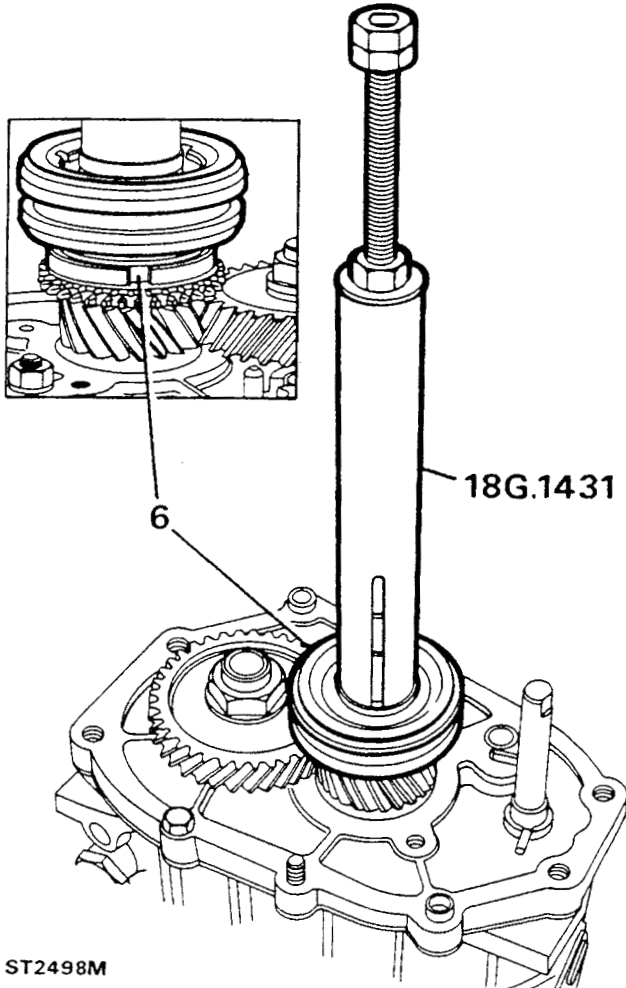




6. Press fifth gear synchromesh assembly to mainshaft using 18G 1431.



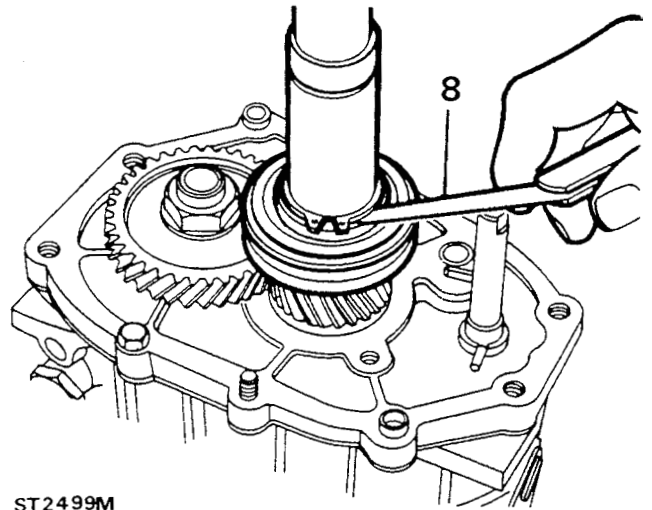
CAUTION: Before pressing the assembly fully home, ensure that the slipper pads locate in the baulk ring slots.



NOTE: Only limited movement of the synchromesh inner member on the main-shaft is permissible. The maximum clearance is 0,005mm to 0,055mm (0.0002in) to (0.002in) and to achieve this the following selective washers are available.

Part number	Thickness
FRC 5284	5,10
FRC 5286	5,16
FRC 5288	5,22
FRC 5290	5,58
FRC 5292	5,34
FRC 5294	5,40
FRC 5296	5,46
FRC 5298	5,52
FRC 5300	5,58
FRC 5302	5.64

7. Fit the thinnest washer and secure with circlip.  
8. Measure clearance between circlip and washer,

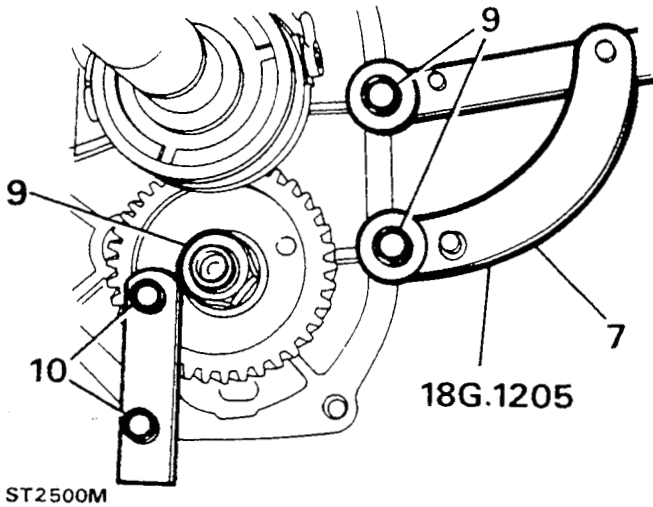


9. Tighten layshaft stake nut using 18G 1205.

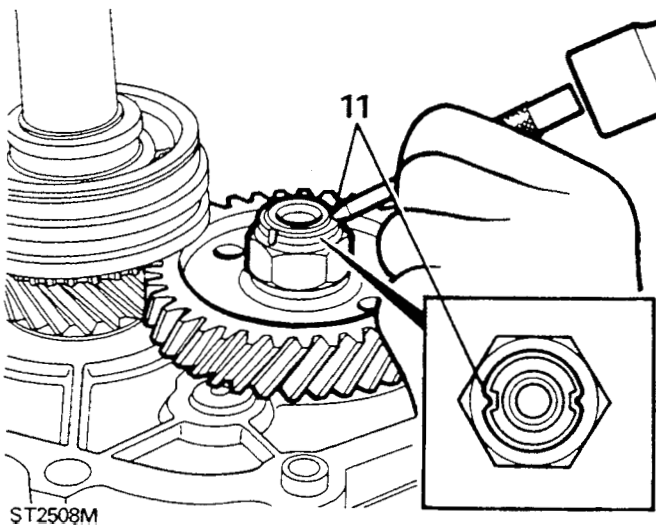


CAUTION: The practice of locking gears to provide a restraint to tighten the nut is not acceptable due to high torque figure required.

- Secure tool "A" to gear and gear case and using a suitable torque wrench tighten the nut to the correct torque.

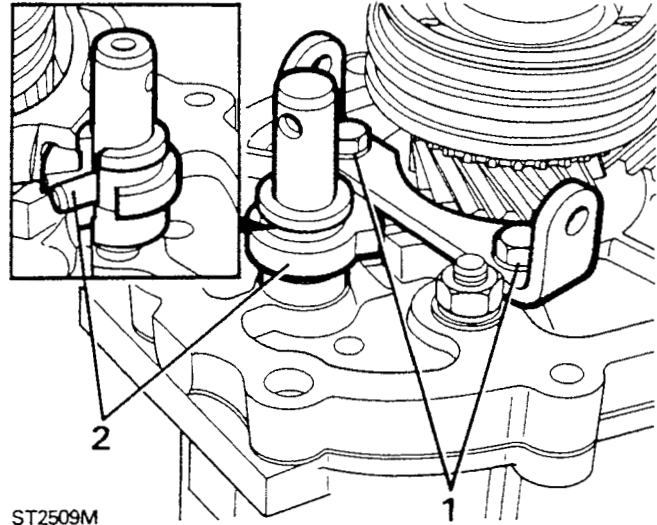


- Using a round nose punch, form the collar into the layshaft slots.



**FIFTH GEAR SELECTOR FORK ASSEMBLY**

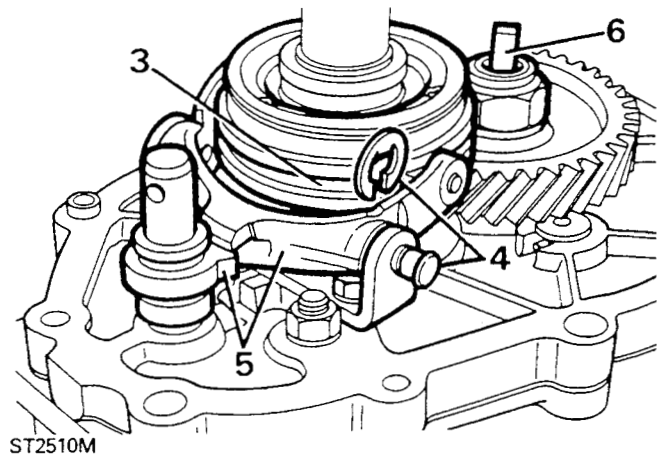
- Fit fifth gear selector fork bracket.
- Fit the fifth gear spool long end towards centre plate.



- Fit slippers to selector fork.
- Fit fork to synchromesh and secure with pins and "E" clips.

**NOTE:** Before fitting pins and clips cover holes in centre plate to prevent them falling into casing.

- Engage tongue of spool in selector fork.
- Fit oil pump drive to layshaft.





**EXTENSION CASE**

1. Release centre plate from workstand and fit gasket on joint face.
2. Fit extension case while aligning oil pick-up pipe. Remove guide studs and secure to main case.

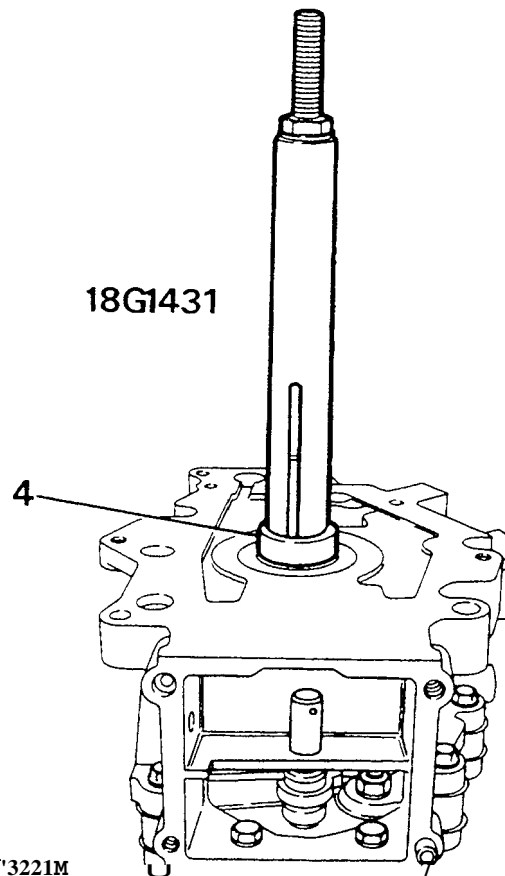
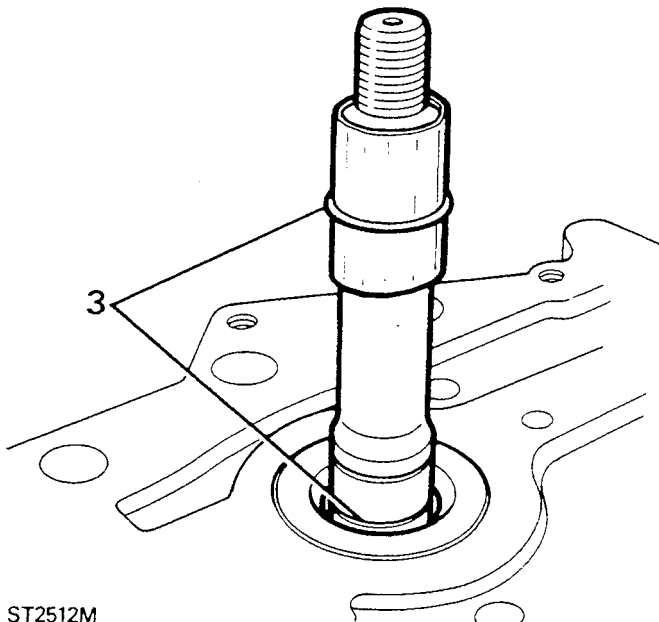


**NOTE:** Do not use force, if necessary remove case and re-align oil pump drive if case does not fit first time.



**CAUTION:** To protect "O" ring while fitting, cover mainshaft splines with smooth tape.

3. Fit "O" ring to mainshaft groove.



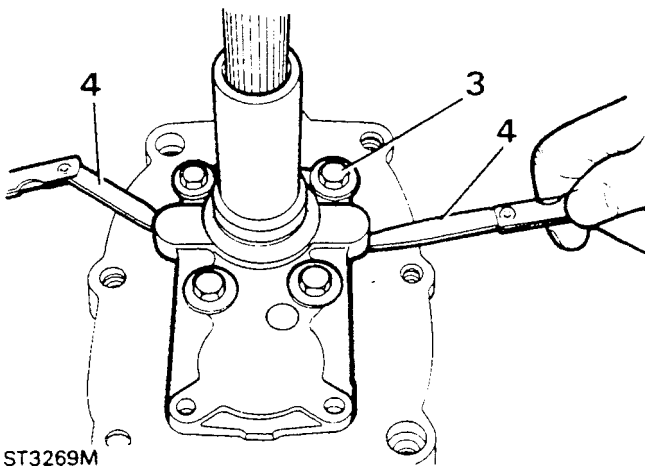
4. Fit "O" ring collar to mainshaft using 18G 1431

INPUT-MAINSHAFT BEARING ADJUSTMENT

1. Turn gearbox over with input shaft uppermost. Remove layshaft support plate.

NOTE: Correct shimming of the input shaft bearing is vital to ensure that the mainshaft assembly has the design intended end float, and the bearings are not pre-loaded.

2. Measure the thickness of a new front cover gasket.
3. Place the original shim on mainshaft bearing and finger tighten the bolts.
4. Measure the clearance between front cover and gearcase with two feeler gauges.



ST3269M

5. If required, change the selective washer to provide a clearance of 0,35mm to 0,085mm (0.001 to 0.003ins) less than the gasket thickness.

NOTE: This will ensure that when the gasket and cover is fitted to the correct torque, the input and mainshaft bearings will have no pre-load and not more than 0,06mm (0.0025in) end float.

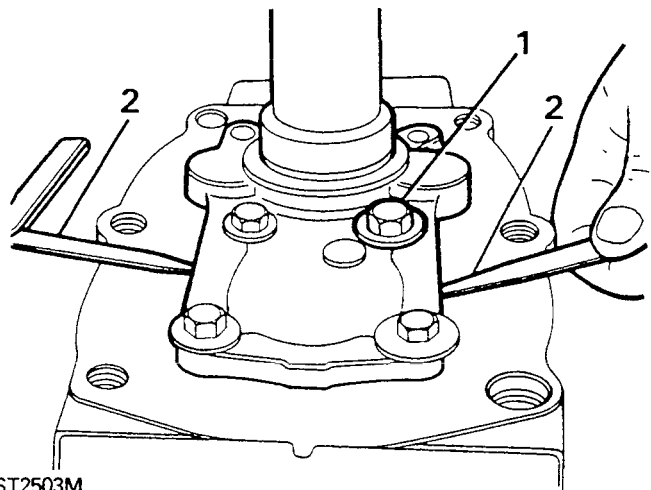
6. Remove front cover and keep gasket and selective washer together.

Mainshaft selective washers

Part number	Thickness(mm)
FRC 4327	1,51
FRC 4329	1,57
FRC 4331	1,63
FRC 4333	1,69
FRC 4335	1,75
FRC 4337	1,81
FRC 4339	1,87
FRC 4341	1,93
FRC 4343	1,99
FRC 4345	2,05
FRC 4347	2,11
FRC 4349	2,17
FRC 4351	2,23
FRC 4353	2,29
FRC 4355	2,35
FRC 4357	2,41
FRC 4359	2,47
FRC 4361	2,53
FRC 4363	2,59
FRC 4365	2,65
FRC 4367	2,67
FRC 4369	2,77


LAYSHAFT BEARING ADJUSTMENT

1. Place original selective washer on layshaft bearing, fit front cover without gasket, and finger tighten bolts.
2. Measure clearance, with two feeler gauges, between cover and gearcase. Select a shim that will provide a clearance equal to the thickness of the gasket that was selected and measured when calculating the adjustment of the input and mainshaft bearing.

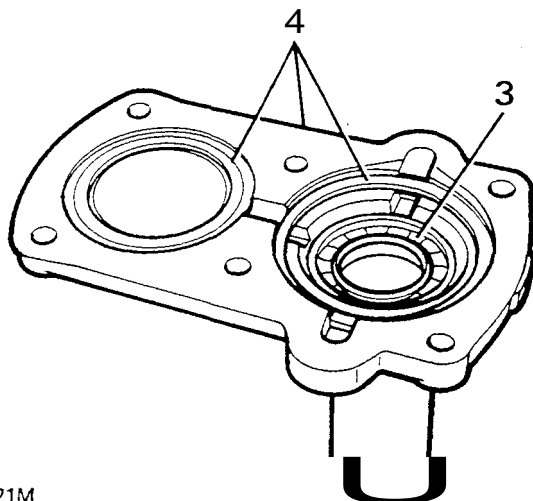


ST2503M



 NOTE: This will ensure zero layshaft bearing end float and not more than 0,025mm (0.001 in) pre-load once the cover and gasket are fitted and bolts correctly torqued.

3. Remove cover and selected washer and fit new oil seal, lip towards gearcase.
4. Fit mainshaft and layshaft selected washers and gasket.



ST2521M

5. Wrap protective tape round input shaft splines.
6. Apply Hylomar PL 32 to bolt threads and secure cover.

Layshaft selective washers.

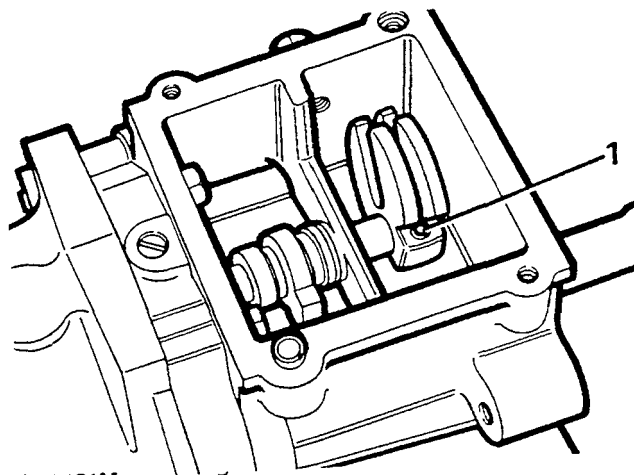
Part number	Thickness(mm)
FTC 0262	1,36
FTC 0264	1,42
FTC 0266	1,48
FTC 0268	1,54
FTC 0270	1,60
FTC 0272	1,66
FTC 0274	1,72
FTC 0276	1,78
FTC 0278	1,84
FTC 0280	1,90
FTC 0282	1,96
FTC 0284	2,02
FTC 0286	2,08
FTC 0288	2,14
FTC 0290	2,20
FTC 0292	2,26
FTC 0294	2,32
FTC 0296	2,38

GEAR LEVER AND REMOTE HOUSING ASSEMBLY

1. Fit quadrant to selector shaft with new roll pin.



NOTE: Push shaft forward, fit quadrant so ledge is to the left viewing box from rear. Return shaft to neutral position.



ST2191M

2. With a new gasket, fit remote housing locating over dowels.

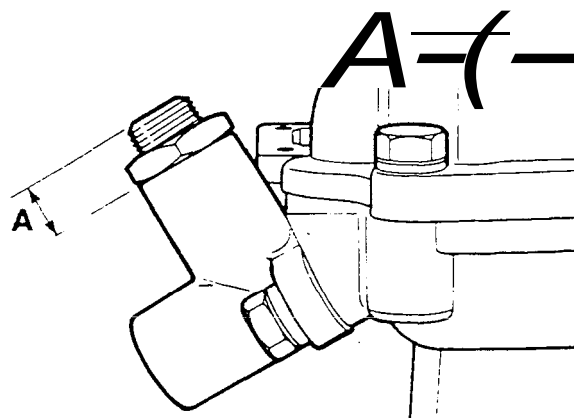


NOTE: Ensure rollers locate in quadrant fork.

3. Fit transfer gear change housing.

Reverse gear plunger adjustment.

1. Fit plunger with original shims and tighten bolts.
2. Slacken locknut, turn adjuster screw so that dimension "A" is approximately 12 mm (0.50 in). Tighten locknut.



ST3223M



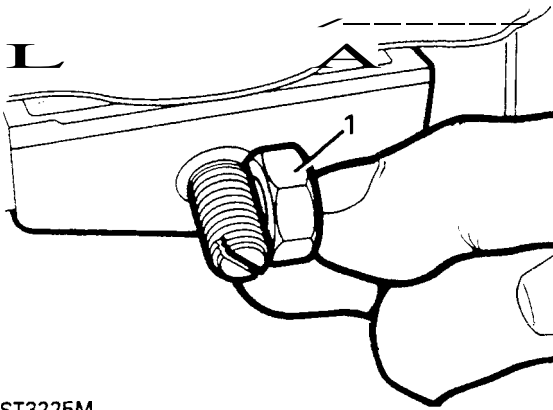
NOTE: If necessary, final adjustment can be made in vehicle. To increase pull-over load turn screw clockwise or anti-clockwise to reduce load.

Fifth gear stop screw adjustment.

1. Adjust screw to protrude from housing the distance across corners of locknut.

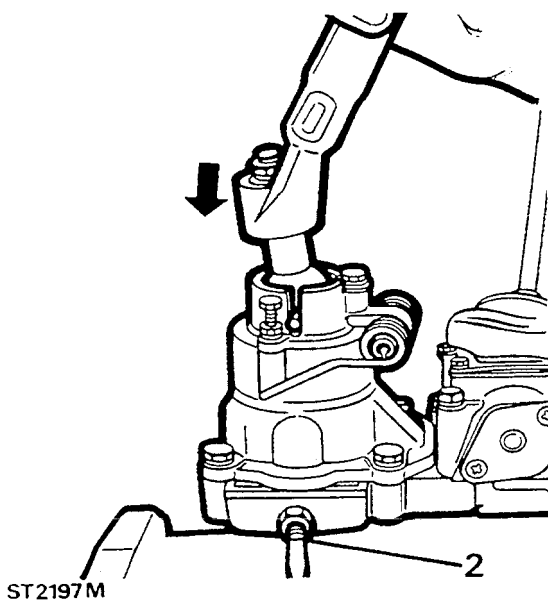


NOTE: This is only an approximate setting which will limit travel of selector yoke but will allow fifth gear to be selected.



ST3225M

2. Select fifth gear. While applying light pressure to gear lever towards right, turn screw clockwise until it contacts yoke. Turn screw half a turn anti-clockwise and tighten nut.



ST2197M

Bias spring adjustment



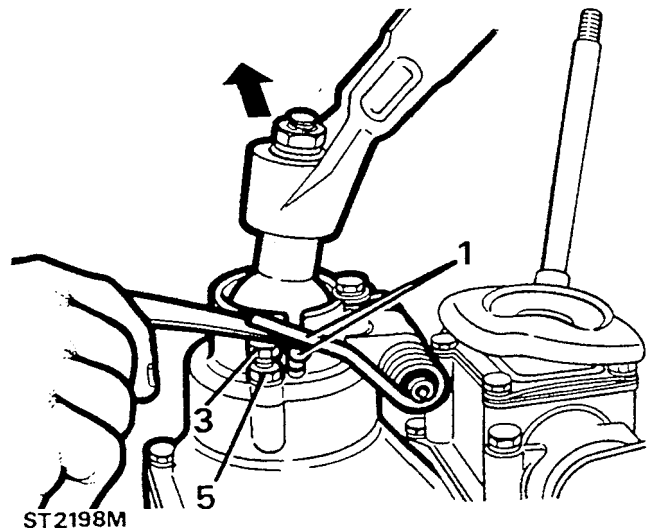
NOTE: The purpose of this adjustment is to set both bolts so that the bias spring legs apply equal pressure on both ends of the gear lever cross pin when third or fourth gear is engaged. This will ensure that when the lever is in neutral, the gear change mechanism is automatically aligned for third or fourth gear selection.

1. Select fourth gear and lift both spring legs over the cross pins.
2. Turn adjustment bolts until heads touch spring legs.
3. Apply light pressure to gear lever to the right and adjust left hand bolt.



NOTE: Clearance between spring leg and bolt 0,05 mm (0.002 in.) using feeler gauge.

4. Move lever to left and adjust right hand bolt to clearance.
5. Tighten locknuts.



ST2198M



BELL HOUSING - FOUR CYLINDER ENGINE

1. Fit bellhousing locating over hollow dowels and secure with bolts.

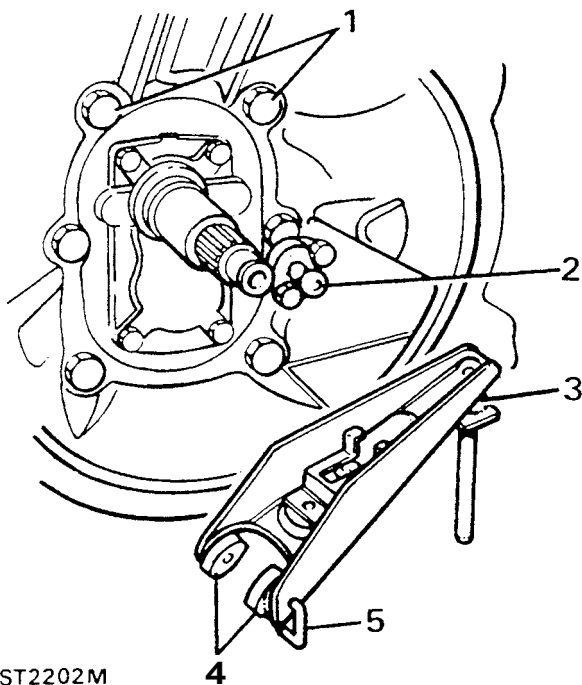


NOTE: Fit the 12 x 45 mm bolts through dowels and 12 x 30 mm bolts in remaining positions.

2. Secure pivot post.
3. Apply molybdenum disulphide grease to pivot post, lever pads and pins.
4. Assemble pads to lever and lever to bearing and fit assembly to pivot post.
5. Fit staple to release assembly, short leg to lever.



NOTE: The staple is an aid to assembly only which may become dislodged or lost in service without detriment.



ST2202M

BELL HOUSING - V8 ENGINE

1. Fit bell housing locating on hollow dowels.



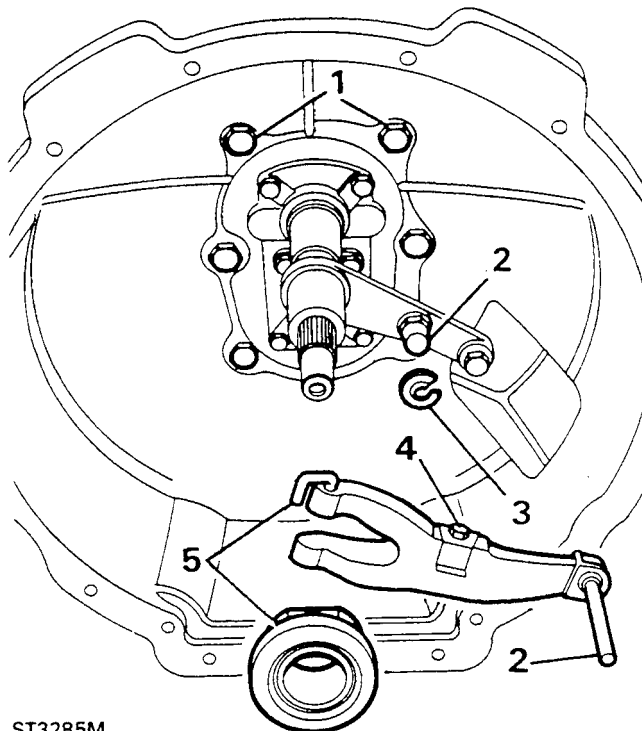
NOTE: Fit the 12 x 45mm bolts through dowels and 12 x 30mm bolts in remaining positions.

2. Apply molybdenum disulphide grease to pivot post, release lever, socket and push rod. Not the bearing guide.
3. Fit 'C' washer to pivot post.
4. Fit spring clip to lever and fit lever to pivot post.

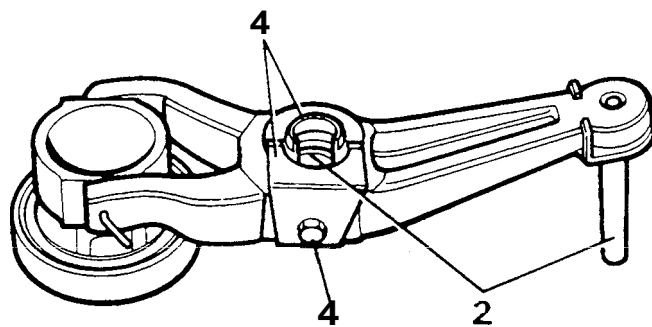


NOTE: Position spring clip behind 'C' washer and tighten screw.

5. Fit bearing and retain with plastic staple.



ST3285M



ST3286M








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**DATA**


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Reverse lever and slipper pad clearance .....	0,725 mm
Reverse gear plunger operating load .....	45 to 55 kg
Synchromesh assemblies push through load .....	8,2 to 10 kgf
Clearance between baulk rings and gears .....	0,38 mm
Fifth gear end float .....	0,020 mm
Third gear end float .....	0,020 mm
Second gear end float .....	0,020 mm
First gear bush end float .....	0,075 mm
First gear end float .....	0,20 mm
Fifth gear synchromesh end float .....	0,005 to 0,055 mm

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**TORQUE VALUES**


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**NOTE: Torque wrenches should be regularly checked for accuracy to ensure that all fixings are tightened to the correct torque.**

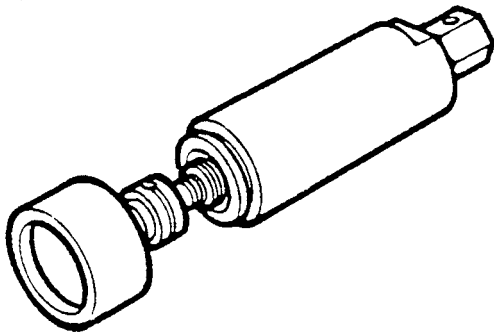
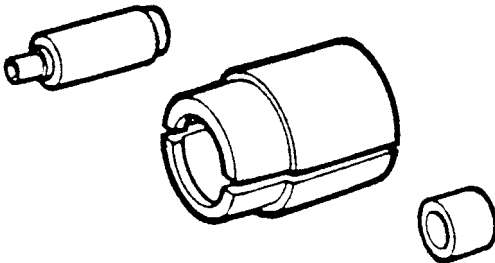
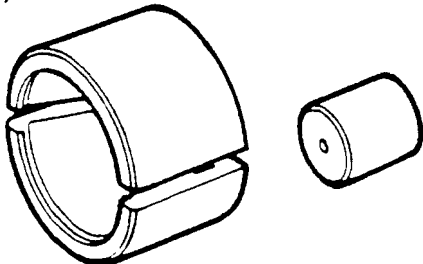
	Nm
Oil pump to extension case	7 - 10
Clip clutch release lever	7 - 10
Spool retainer to gearcase	7 - 10
Spool guide to remote housing	7 - 10
Extension case to gearcase	7 - 10
Pivot plate, clutch release	22 - 28
Remote housing to gearcase	22 - 28
Gear lever housing to remote housing	22 - 28
Guide, clutch release sleeve	22 - 28
Slave cylinder to bell housing	22 - 28
Front cover to gearcase	22 - 28
Fifth gear support bracket bolts	22 - 28
Plunger housing to remote housing	22 - 28
Gear lever retainer	7 - 10
Lower gear lever to extension nut	40 - 47
Reverse lever pivot post nut	22 - 28
Clutch housing to gearbox bolts	65 - 80
Plug, detent spring and ball	22 - 28
Oil drain plug	47 - 54
Oil filter plug	65 - 80
Oil filler - level plug	25 - 35
Breather	14 - 16
Fifth gear layshaft stake nut	204 - 231
Bottom cover to clutch housing	7 - 10

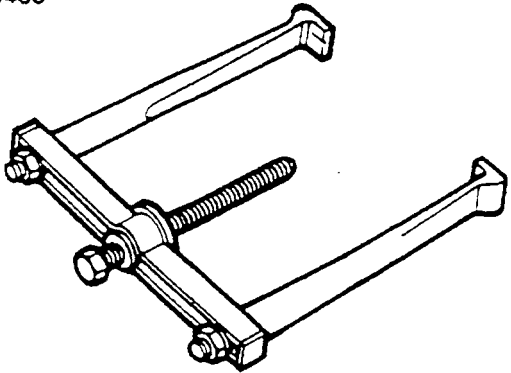
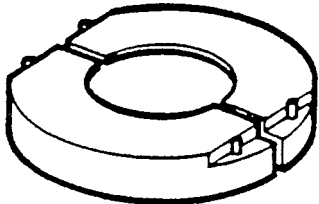
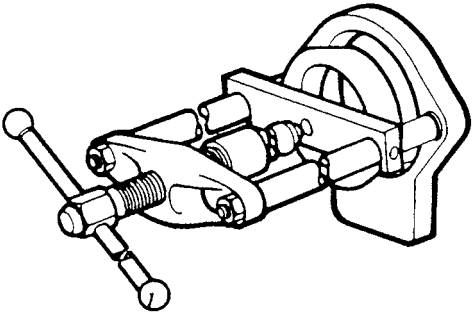
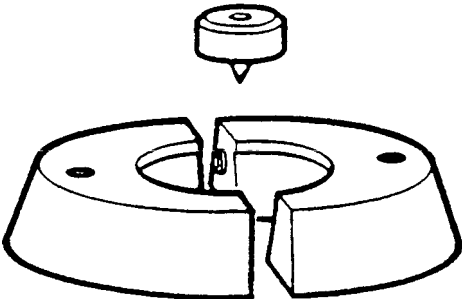




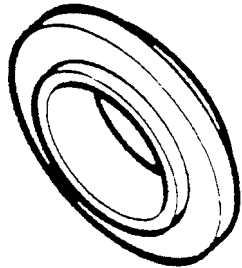
**SERVICE TOOLS**

NOTE: Where the use of special tools is specified, only these tools should be used to avoid the possibility of personal injury and or damage to components.

<p>18G.705</p>  <p>18G 705 Puller, bearing remover</p>
<p>18G.705-1A</p>  <p>8G 705-1A Adaptor for mainshaft oil seal track and layshaft fifth gear</p>
<p>18G.705-7</p>  <p>8G 705-7 Adaptor for layshaft bearings</p>

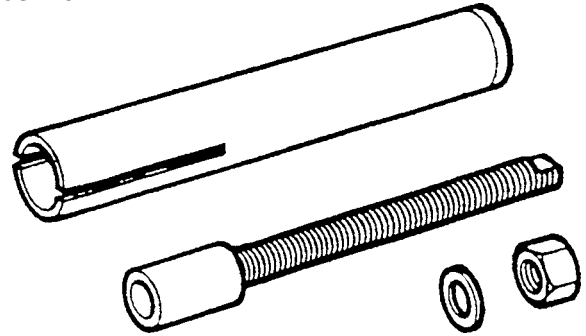
<p>18G.1400</p>  <p>18G 1400 Remover synchromesh hub and gear cluster</p>
<p>18G.7400-1</p>  <p>8G 1400-1 Adaptor mainshaft fifth gear</p>
<p>MS47 1S 47</p>  <p>MS47 1S 47 Hand press</p>
<p>18G.47BA</p>  <p>8G 47BA Adaptor input shaft bearing</p>

18G.47BAX



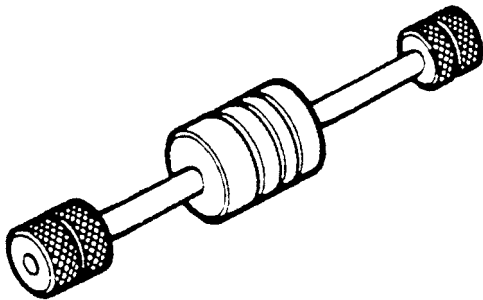
18G 47BAX Conversion kit

18G.1431



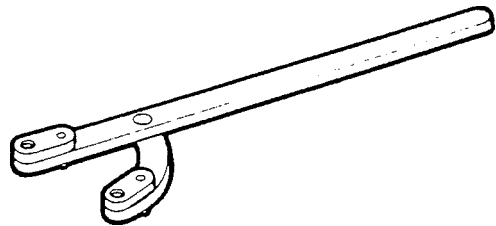
18G 1431 Mainshaft rear oil seal replacer

18G.284 (MS.284)



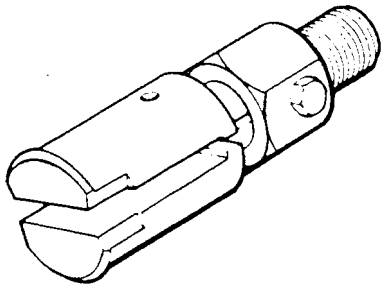
18G 284 Impulse extractor

18G1205



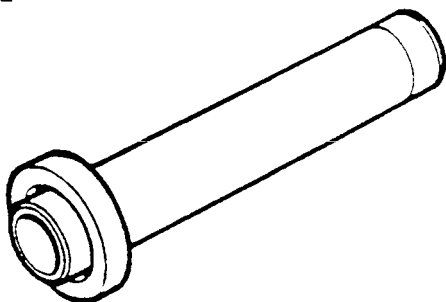
18G 1205 Flange holder

18G284AAH



8G 284AAH Adaptor for input shaft pilot bearing track

18G.1422



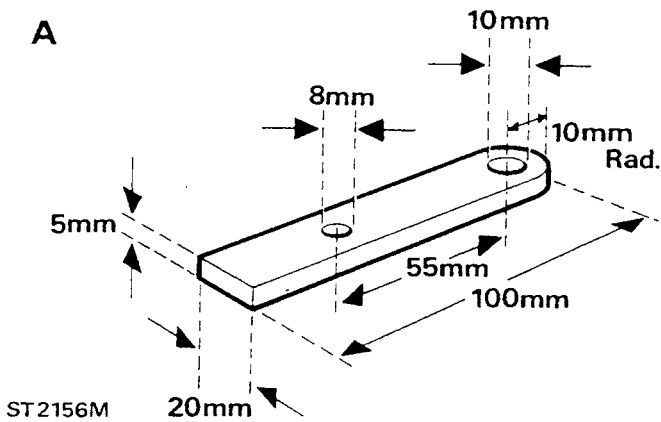
8G 1422 Mainshaft rear oil seal replacer



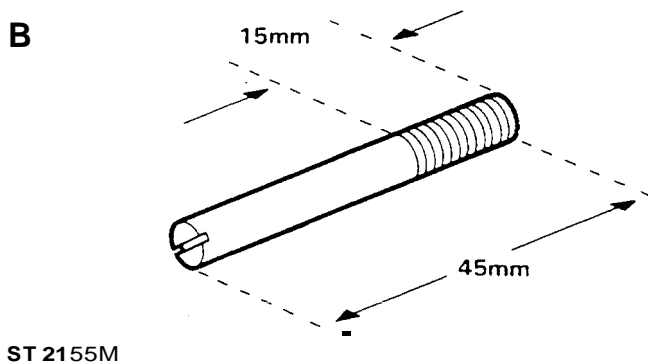
**LOCALLY MANUFACTURED TOOLS**

In addition to the special service tools, the following tools can be locally made to assist the dismantling and assembly of the gearbox. The following overhaul procedure is based upon the assumption that these tools are available.

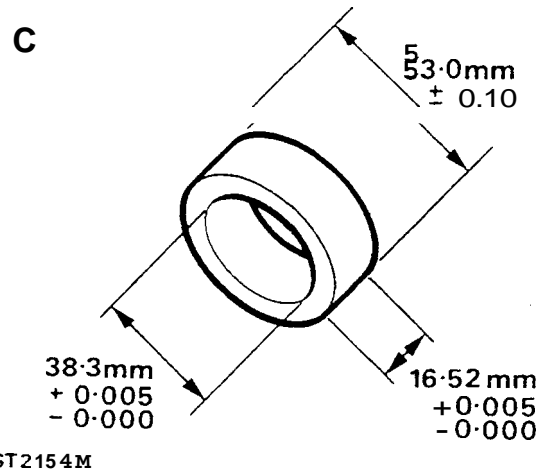
**Tool 'A'.** Dual purpose tool. Reverse shaft retainer to prevent the shaft falling out when the gearbox is inverted. Also, a layshaft fifth gear retainer to hold the fifth gear whilst releasing stake nut. Use 5mm mild steel to manufacture the tool. When using the tool for the layshaft nut, a suitable spacer is required 20mm diameter 23mm long, with an 8mm diameter clearance hole.



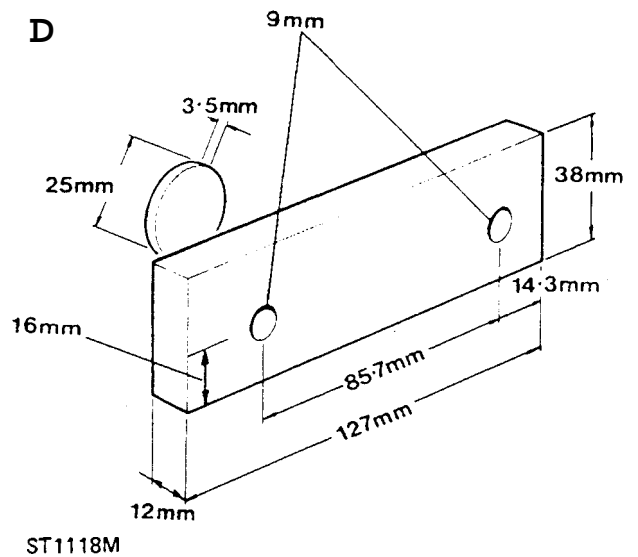
**Tool 'B'.** Four pilot studs with an 8mm thread for locating in the four counter sunk blind holes in the workstand.



**Tool 'C'.** Mild steel dummy centre bearing for the selection of first gear bush.

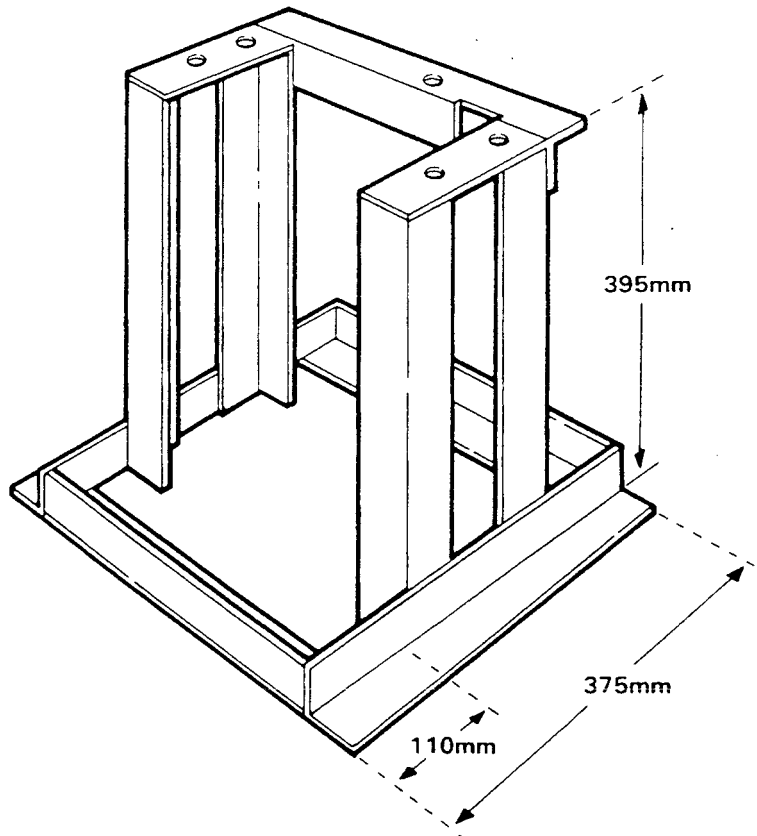
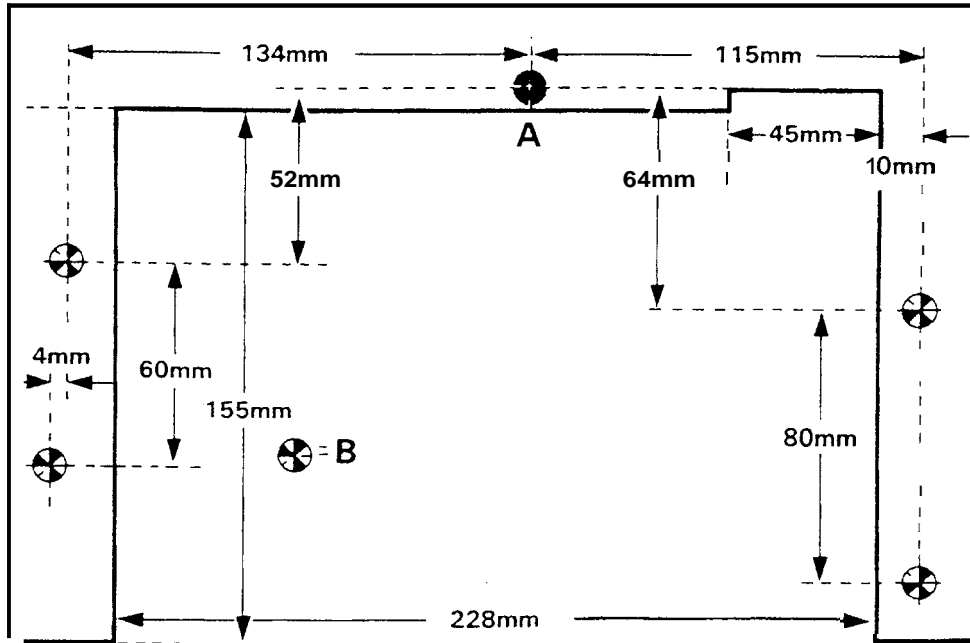


**Tool 'D'.** Layshaft support plate is fitted with two 8 x 25mm bolts and washers to the front of the gearbox case. It also supports the input shaft bearing outer track.



Tool 'E'. Workstand for securely locating the gearbox during overhaul. Manufacture from 30mm x 30mm angle iron. The single hole marked 'A' should be drilled through the material with a 10mm drill.

The four counter sunk blind holes marked 'B' should also be made with a 10mm drill, but must not be drilled through the material.



ST2153M

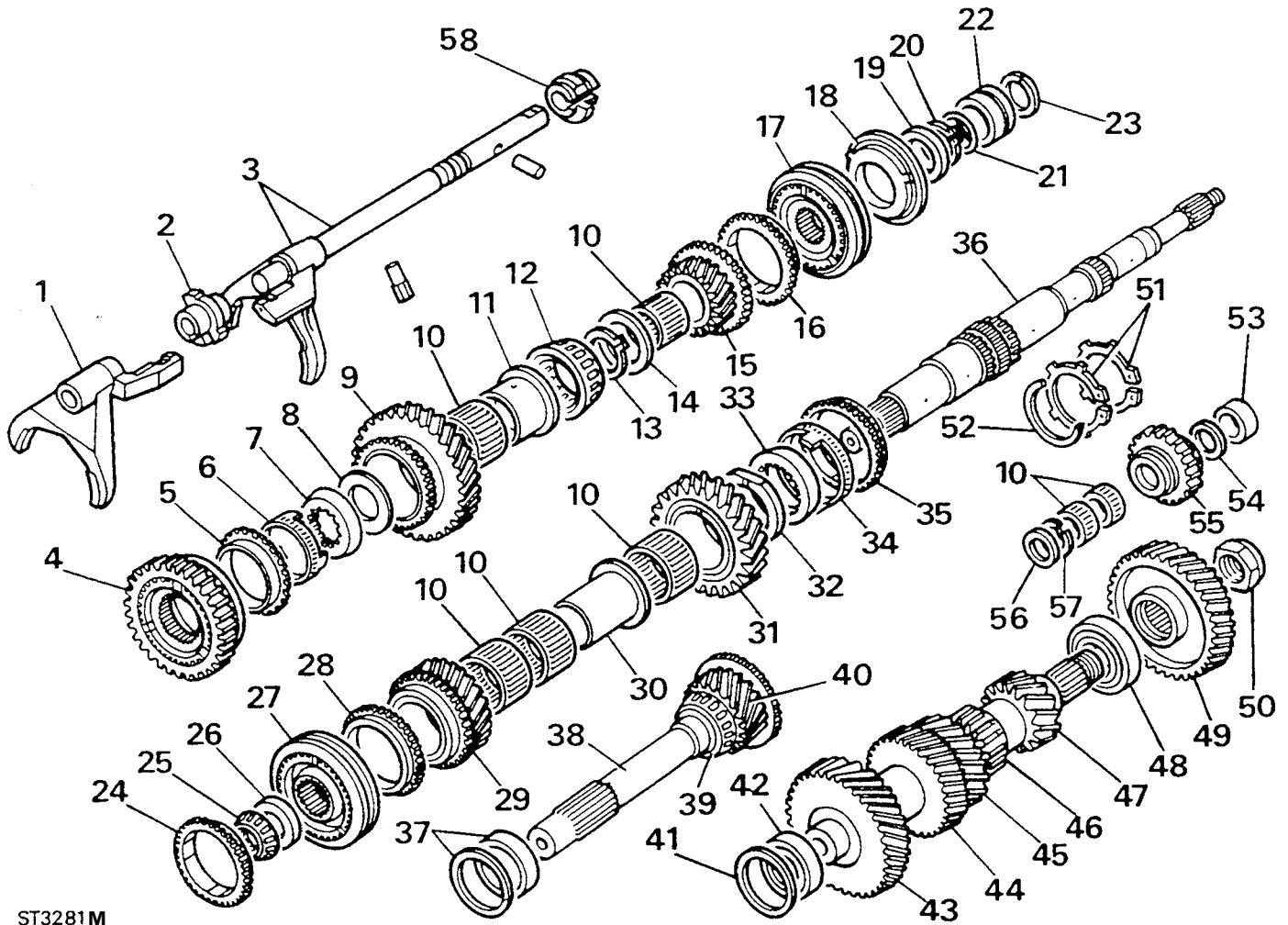


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**GEARS AND SHAFTS**

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1. Third - fourth selector fork.
2. Interlock spool.
3. First - second fork and selector rail assembly.
4. First - second synchronesh.
5. First gear synchronesh outer baulk ring.
6. First gear synchronesh inner baulk ring.
7. Cone.
8. Thrust washer.
9. First gear.
10. Needle roller bearings.
11. First gear selective bush.
12. Centre taper roller bearing.
13. Circlip.
14. Thrust washer.
15. Fifth gear.
16. Fifth gear baulk ring.
17. Fifth gear synchronesh.
18. Fifth gear synchronesh back plate.
19. Fifth gear synchronesh selective washer.
20. Circlip.
21. "O" ring.
22. Oil seal collar.
23. Snap ring.
24. Fourth gear baulk ring.
25. Pilot taper bearing.
26. Spacer.
27. Third - fourth synchronesh.
28. Third gear baulk ring.
29. Third gear.
30. Third gear bush.
31. Second gear.
32. Thrust washer.
33. Cone.
34. Second gear synchronesh inner baulk ring.
35. Second gear synchronesh outer baulk ring.
36. Mainshaft.
37. Input shaft bearing track and selective washer.
38. Input shaft.
39. Input shaft taper bearing.
40. Fourth gear.
41. Selective shim.
42. Taper bearing.
43. Layshaft fourth gear.
44. Layshaft third gear.
45. Layshaft second gear.
46. Layshaft reverse gear.
47. Layshaft first gear.
48. Taper bearing.
49. Layshaft fifth gear.
50. Layshaft fifth gear retaining stake nut.
51. Circlips retaining first gear and first-second gear synchronesh.
52. Snap ring retaining second gear cone and spacer.
53. Spacer.
54. Snap ring.
55. Reverse idler gear.
56. Thrust washer.
57. Snap ring.
58. Fifth gear spool.



ST3281M





**GEARBOX CASING**

1. Front cover.
2. Front cover oil seal.
3. Front cover gasket.
4. Oil drain plug and washer.
5. Oil level plug.
6. Gearbox main casing.
7. Spool retainer.
8. Gasket.
9. Inboard detent ball and spring.
10. Reverse lever and slipper.
11. Locating dowels - centre plate to maincase.
12. Reverse lever pivot post.
13. Centre plate.
14. Selector plug, detent ball and spring.
15. Gasket.
16. Fifth gear selector bracket.
17. Fifth gear selector fork.
18. Reverse gear shaft.
19. Oil pick-up pipe.
20. Oil pump drive shaft.
21. Oil pump gears and cover.
22. Fifth gear extension housing.
23. Fifth gear extension housing drain plug and filter.
24. Ferrobestos bush.
25. Oil seal.

